Wisconsin Elections Commission

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DATE: For the December 2, 2019 Commission Meeting

TO: Members, Wisconsin Elections Commission

FROM: Meagan Wolfe
Administrator

<u>Prepared and Presented by</u>:
Robert Williams   Cody Davies
Elections Specialist   Elections Specialist

SUBJECT: Election Systems and Software (ES&S)
Petition for Approval of Electronic Voting Systems EVS 5.3.4.1

Introduction

Election Systems and Software (ES&S) is requesting the Wisconsin Elections Commission ("WEC" or "Commission") approve the EVS 5.3.4.1 voting systems for sale and use in the State of Wisconsin. The Government Accountability Board originally approved the EVS system, with EVS 5.2.0.0 and EVS 5.3.0.0, on September 4, 2014. No electronic voting equipment may be offered for sale or utilized in Wisconsin unless first approved by the WEC based upon the requirements of Wis. Stat. § 5.91 (Appendix B). The WEC has also adopted administrative rules detailing the approval process in Wis. Admin. Code Ch. EL 7 (Appendix C).

Application Background

On July 10, 2019, WEC staff received an Application for Approval of EVS 5.3.4.1. ES&S submitted complete specifications for hardware, firmware, and software related to the voting system. In addition, ES&S submitted technical manuals, documentation, and instruction materials necessary for the operation of EVS 5.3.4.1. Also included with the application documentation was the testing report from the Voting Equipment Testing Lab (VSTL) which conducted federal level testing for this system. Initially, ES&S requested that Commission staff proceed with testing using EVS 5.2.4.0 as a "base system" for approval of EVS 5.3.4.1. Normally, when an application is received for a system containing a telecommunications component for modeming unofficial results, the application will contain a "base" system version which is EAC certified and a secondary system version which is identical to the "base" system except for the addition of a telecommunications hardware. In such applications, EVS 5.3.4.1 being among them, the secondary system version lacks EAC certification, but is federally tested to

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comply with the 2005 Voluntary Voting Systems Guidelines (VVSG). After researching application documentation submitted by ES&S and through numerous exchanges with the VSTL, Pro V&V, staff determined that there were enough changes between EVS 5.2.4.0 and EVS 5.3.4.1 that a full test campaign was warranted prior to seeking Commission approval of EVS 5.3.4.1.

Updates introduced in this system version include:

- Upgrade to modems with 4G capabilities via the Verizon Private Network.
- Support for write-in review to be sorted by precinct or to not display contests in which no write-in votes were recorded.

Recommendation

WEC staff is recommending approval of EVS 5.3.4.1 for sale and use in Wisconsin. Detailed recommendations are listed on pages 20 and 21 following the analysis of functional testing performed by WEC staff.

System Overview

EVS 5.3.4.1 is a federally tested paper based, digital scan voting system powered by the ElectionWare software platform. It consists of eight major components: an election management system (EMS) server; an EMS client workstation (desktop and/or laptop computer); the ExpressVote and AutoMark, two Americans with Disabilities Act ("ADA") compliant vote capture devices for polling place use; ExpressLink, a ballot activation code application and barcode printer combination for ExpressVote ballots; the DS200, a polling place scanner and tabulator; the DS450, a mid-range scanner and tabulator for a central count location; and the DS850, a high-speed scanner and tabulator for a central count location.

EVS 5.3.4.1 is a federally tested modification to the EAC certified EVS 5.2.4.1 voting system, which is, in turn, baselined from the EAC certified EVS 5.2.4.0. EVS 5.3.4.1 provides support for modeming of unofficial election results from a DS200 to a Secure File Transfer Protocol (SFTP) server through encrypted wireless telecommunications networks after the polls close on Election Day. The modeming components of EVS 5.3.4.1 do not meet federal certification standards, but the underlying voting system is federally certified.

The following paragraphs describe the design of the EVS 5.3.4.1 hardware taken in part from ES&S technical documentation.

DS200

The DS200 is a digital scan paper ballot tabulator designed for use at the polling place. After the voter marks a paper ballot, their ballot is inserted into the unit for processing. The tabulator uses a high-resolution scanner to simultaneously image the front and back of the ballot. The resulting ballot images are then processed by proprietary mark recognition software, which identifies and evaluates marks made by the voter. The system then tabulates any votes cast on each ballot

before depositing the ballot into an integrated secured storage bin. The ballot images and election results are stored on a removable USB flash drive. This USB flash drive may be taken to the municipal clerk's office or county clerk's office where the election results may be uploaded into an election results management program or transferred to another memory device to facilitate storage. The DS200 does not store any images or data in its internal memory. The DS200 includes an internal thermal printer for the printing of the zero reports, log reports, and polling place totals upon the official closing of the polls. DS200s as part of EVS 5.3.4.1 also include wireless modems for the transmission of unofficial election results via a secured and encrypted network hosted by Verizon Wireless.

Voter Information Screens: The DS200 features a 12-inch touchscreen display to provide feedback to the voter regarding the disposition of any ballot inserted into the machine. The screens are designed to alert voters to errors on their ballot. The DS200 will, depending on the situation, provide details about the error, identify the specific contests where the errors occurred, allow the ballot to be returned to the voter, and provide the option for the voter to cast the ballot with errors on it.
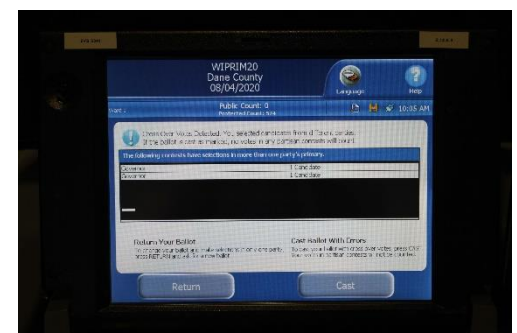
Overvote Notification: If the ballot contains an overvote, a message appears that identifies the contest or contests with overvotes. The message also tells the voter that these votes will not count. The language displayed in this notification reflects the requirements as approved by the Commission.

The voter has the option to return the ballot for review or cast the ballot. If there are multiple errors the voter is given an option to review the next error. Instructions above the "Return" button direct the voter to press "Return" if they wish to correct their ballot. The voter is also instructed to ask for a new ballot. Instructions above the "Cast" button direct the voter to press "Cast" if they wish to submit their ballot with votes that will not count. Instructions above the "Next" button direct the voter to press "Next" if they wish to review additional errors on their ballot. Once all the errors have been reviewed, the voter will have the option to cast the ballot.
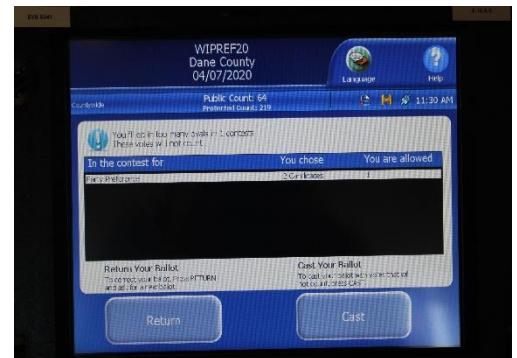
Crossover Vote Notification: If a ballot is inserted with votes in more than one party's primary, a message appears that identifies the contests with crossover votes. As in the notification for an overvote, the language displayed in this notification reflects the requirements as approved by the Commission.

The voter has the ability to return the ballot for review or cast the ballot. If there are multiple errors the voter is given an option to review the next error. Instructions above the "Return" button direct the voter to press "Return" if they wish to correct their ballot to reflect their party preference. The voter is instructed to ask for a new ballot. Instructions above the "Next" button direct the voter to press the "Next" button if they wish to review additional errors on their ballot. Once all errors have been reviewed, the voter will have the option to cast the crossover-voted ballot.

**Blank Ballot Notification:** If the ballot contains no votes, a message appears that states the ballot is blank. The voter is instructed to press "Return" to correct their ballot and see a poll worker for help. The voter is instructed to press "Cast Blank Ballot" to submit their ballot without any selections.
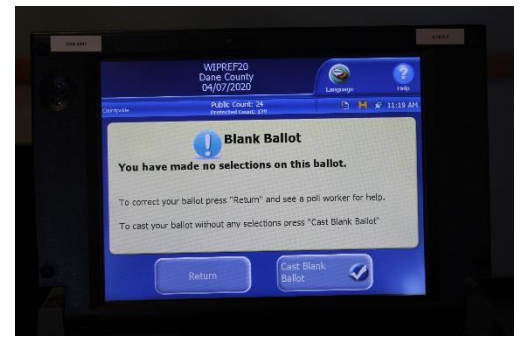
Error Scanning Ballot: If a ballot is inserted incorrectly, the DS200 will return the ballot to the voter and advise that the voter reinsert the ballot into the tabulator. The DS200 does not allow the voter to cast the ballot without resolving the issue and, if the issue persists, the voter is instructed to contact a poll worker for assistance.
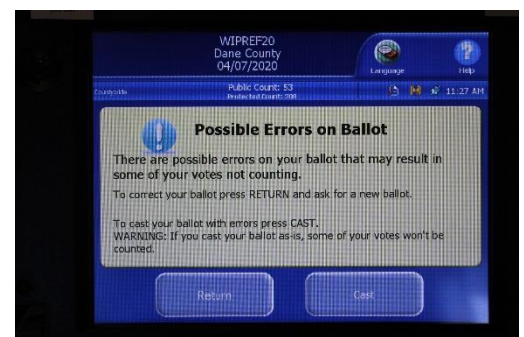
Ballot Jam: This message will be displayed if a ballot becomes jammed during the scanning process. The voter is informed that the tabulator has jammed and that they should contact a poll worker. Voters are also informed of the disposition of their ballot. In the event that the ballot was tabulated prior to the jam, a green check mark appears. If the jam occurred prior to tabulation, a red x is shown, and the screen tells the voter their ballot was not counted.
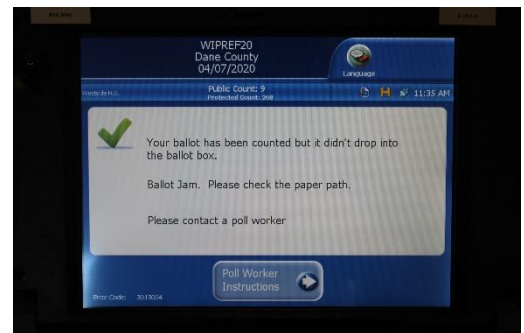
The screen shots above illustrate the manufacturer's default configuration. This system may also be programmed, at the request of the municipality, to automatically reject all ballots with overvotes or crossover votes without the option for override, which requires the voter to correct the error by remaking his or her ballot. This ensures that voters do not mistakenly process a ballot on which a vote for one candidate or all candidates will not count. The automatic rejection configuration of the DS200, however, creates issues for processing absentee ballots because no voter is present to correct the error. These ballots would have to be remade without the improperly voted contests before they could be processed by the DS200.

The DS200 is also capable of producing a results report showing all candidates with write-in votes. This report captures an image of what is written on the write-in vote line, regardless of whether or not the oval is darkened. For EVS 5.3.4.1 the write-in report, which prints on the results tape, is organized by precinct or reporting unit. Previous system versions presented results information by office. Presently, the write-in report is not approved for use. Election inspectors, instead, review ballots by hand searching for write-in votes. This certification application is not seeking approval for the utilization of

the write-in report. Per ES&S, the system was developed anticipating the possibility of future legislation allowing for its use.

Reading Ballots: The DS200 uses proprietary software called Intelligent Mark Recognition to identify properly marked votes on a hand-marked ballot. Ballots used in conjunction with this system are designed with an oval next to the candidate name or ballot choice that a voter would fill in to indicate their choice. The machine uses coordinates determined by the timing marks laid out and printed on the border of the optical scan ballot to determine which contest and candidate each filled-in oval corresponds with. It does not read the actual candidate name printed next to the oval to determine voter intent as the voting equipment programming is responsible for determining the correlation between the filled-in oval and the candidate name.

A digital image of both sides of the ballot is captured by the machine when the ballot is inserted and the DS200 scans the ballot images to determine and record the voter's choices. ES&S recommends that voters use a specific marking device (BIC Grip Roller Ball pen) to mark ballots processed on the DS200. Per the supporting documentation provided by ES&S as part of its application, an improper mark is defined as being "smaller than .005 square inches as a marked response on a pixel count basis." Marks that do not have a greater pixel count than this standard will be read by the equipment as an unmarked oval.

Ballots marked using the ExpressVote are tabulated by the DS200 based on the barcodes that print on the top sections of the ballot card after the voter has made their selections. The barcode at the top of the ballot represents the ballot style for that ballot and indicates to the tabulator which contests and candidates are contained on that style. Each barcode listed in the highlighted section in the image provided to the right represents the same coordinates used by the DS200 to identify contest and candidate information found on the hand-marked optical scan ballot. The DS200 reads those barcodes and uses that information to determine voter intent.

DS450

The DS450 is a mid-range digital scan ballot tabulator designed for use by election officials at a central count facility. This machine can accommodate a variety of different length ballots and can process between 60 and 90 ballots per minute, depending on the size of the ballot. The DS450 uses technology similar to the DS200 to image both sides of the ballot and identify properly marked votes. Three sorting trays are available that can be configured to set apart specific types of ballots for further review. For example, an election official can use the touchscreen interface to program the machine to sort all ballots containing write-in votes or all overvoted ballots into separate trays for hand tabulation or
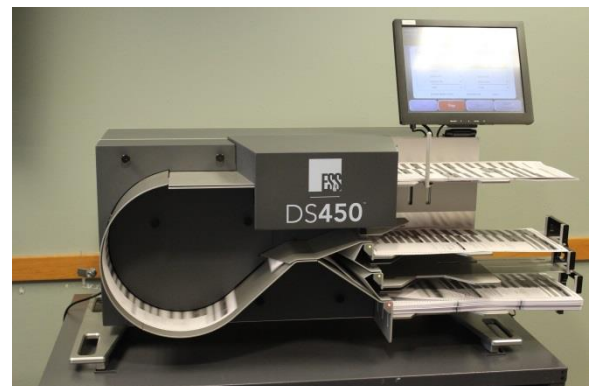
review. While processing ballots, the DS450 prints a continuous audit log to a dedicated audit log printer. Reports are printed from a second printer. The DS450 saves voter selections and ballot images to an internal hard disk and exports results to a USB flash drive for processing with the Election Management System.

DS850

The DS850 is a high-speed, digital scan ballot tabulator designed for use by election officials at a central count facility. The DS850 can scan and count up to 300 ballots per minute. It uses digital cameras and imaging systems to read the front and back of each ballot, evaluate the result, and sort each ballot into trays based on the result to maintain continuous scanning and tabulating. Multiple criteria can be used to segregate ballots for review, including overvotes, crossover votes and blank ballots. Depending on the situation, ballots segregated in this fashion may not be counted and may need to be remade by the election inspectors. Election officials use a 14-inch touchscreen display to program these features of the DS850. While processing ballots, the DS850 prints a continuous audit log to a dedicated audit log printer. Reports are printed from a second connected printer. The DS850 saves voter selections and ballot images to an internal hard disk and exports results to a USB flash drive for processing with the Election Management System.
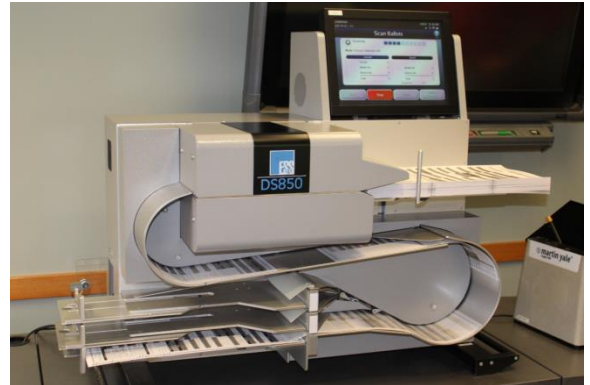
ExpressVote

The ExpressVote is an electronic vote capture device designed for use by all voters. It features a touchscreen display and integrated thermal printer.

Voters insert a blank ballot card in the machine to begin the voting process. Ballot instructions, contests and candidates are displayed on the screen and they have the option to use the touchscreen or the keypad to navigate the ballot and make selections. The voter may adjust the text contrast and size of the display, if needed. Each button on the tactile keypad has both Braille and printed text labels designed to indicate function and use to the voter. In addition, voters may use headphones to access the audio ballot function that provides a recording of the ballot instructions and lists candidates and options for each contest. The volume and tempo of the audio can be adjusted by the voter and they can use the touchscreen, tactile keypad, or other assistive technology to make their selections.

The ExpressVote provides a ballot summary screen for the voter to review their selections before the ballot is marked by the built-in printer. Overvotes and crossover votes cannot occur on this equipment and a voter is warned about undervotes on the ballot summary screen. Once the voter confirms their selections, those selections are printed on the blank ballot card and the machine returns the ballot card to the voter. ExpressVote ballot cards do not employ an oval format but utilize an unambiguous ballot format where the names of candidates and referendum choices are printed directly on the ballot card

along with the names of the contest. The phrase "No Selection Made" appears under any contest in which the elector did not vote.

After the voter completes the process, the ExpressVote clears its internal memory and the paper ballot is the only record of the voting selections made. Ballot cards marked using the ExpressVote can be processed by the DS200, DS450, or DS850. ExpressVote ballot cards can also be deposited into a secured ballot box to be hand tabulated by election inspectors after the polls have closed.

AutoMARK

The AutoMARK is an electronic ballot marking device primarily designed for use by voters who have visual or physical limitations or disabilities.

Voters insert a blank paper ballot in the machine to begin the voting process. They then have the option to use the touchscreen or an integrated tactile keypad to navigate the ballot and make ballot selections. Instructions that guide the voter through the process appear on the screen or can be accessed via the audio ballot function. The voter has the option to adjust the text display contrast and text size to suit their preference. Each button on the tactile keypad has both Braille and printed text labels designed to indicate function and a related shape to help the voter determine its use. In addition, voters may also use headphones to access the audio ballot function that provides a recording of the ballot instructions and lists candidates and options for each contest. The volume and tempo of the audio can be adjusted by the voter and they can use the touchscreen, tactile keypad, or other assistive technology to make their selections.

The AutoMARK provides a ballot summary screen for the voter to review their selections before the ballot is marked by the built-in printer. Overvotes and crossover votes cannot occur on this equipment and a voter is warned about undervotes on the ballot summary screen. Once the voter confirms their selections, those selections are marked on ballot and the machine returns the ballot to the voter.

After the voter completes the process, the AutoMARK clears its internal memory and the paper ballot is the only record of the voting selections made. Ballots marked using the AutoMark can be processed by the DS200, DS450, or DS850. AutoMark ballots can also be deposited into a secured ballot box to be hand tabulated by election inspectors after the polls have closed.

ExpressLink

ExpressLink is an application software used to pre-print ballot cards for the ExpressVote so that ballot style information is automatically loaded when the ballot card is put into the ExpressVote. Ballot style information, in the form of a barcode for Ward 1 ballots and a different code for Ward 2 ballots, are printed at the top of the blank ExpressVote ballot card using an ExpressLink associated printer. If blank ballot cards are used in these situations, a poll worker or voter will be prompted to select the correct ballot style upon inserting the activation card. WEC staff pre-printed activation cards for this test campaign using this application and the ExpressLink printer. WEC staff incorporated these preprinted activation cards into the in-office equipment testing by including 100 ballot cards in 10 reporting units

as part of the ExpressVote ballot test deck. A more detailed explanation of the ExpressLink testing on page 11 of this report.

As in previous testing campaigns, this feature worked as designed. However, neither the ExpressLink application nor ExpressLink printer are federally certified by the EAC. Pro V&V, a Voting System Test Laboratory, determined it to be outside of the scope of certification but Pro V&V did review the source code for 2005 VVSG compliance. Pro V&V tested the equipment and found that it functions as stated in the technical data package for this voting system. No other federal testing was performed on this equipment. ES&S states that these products do not require federal certification. These products are described as ancillary products available to a jurisdiction who may purchase the system. These products are not required for the ExpressVote to function and, in their absence, election inspectors will need to activate each ballot on the ExpressVote if more than one ballot style is available on the machine.

EVS 5.3.4.1 also features a Regional Results program. This stand-alone application allows for the transmission of unofficial election results from a regional location to a central office utilizing a wireless network provided Verizon. The Regional Results application allows election media containing results from different polling places to be read and then securely transferred to a server at a central office location such as the county clerk's office. Neither the modem function of the DS200 nor the Regional Results program impacts the tabulation of official election results.

Modeming Functionality

EVS 5.3.4.1 provides support for modeming of unofficial election results from a DS200 to a Secure File Transfer Protocol (SFTP) server, located in the offices of the county clerk, through a secured and encrypted wireless telecommunications network. The modem in the DS200 communicates with the Verizon Private Network to transmit unofficial election night results as an encrypted data packet to a secure server at a central office location, such as the county clerk's office.

The server hosts a secure file transfer commercial off the shelf software package. A firewall provides a buffer between the network segment, where the server is located, and other internal virtual networks. The data that is transmitted is encrypted and it is digitally signed. The modem function on the DS200 may only be used after an election inspector has closed the polls and entered a password to access the control panel. The network is configured to only allow valid connections with the correct encryption key to connect to the SFTP server. The firewall further restricts the flow and connectivity of traffic. As the system determines that an incoming data packet contains the correct encryption key, the information is passed through the SFTP server and on to the Election Management System (EMS) workstation.

The EMS is required to be deployed on a "hardened system," meaning that all software that is not essential to the proper functioning of the EMS is removed from the computer where the EMS is installed. This procedure is designed to increase the security of the system through the elimination of applications that may provide "back door" access to the system. Access to the internet is also restricted and the EMS provides an audit log of all system actions and connection attempts that can be used to verify unauthorized access to the system while unofficial election results are being transmitted after the close of polls.

While previous versions of the EMS supported modeming through a number of service providers, e.g., Sprint, AT&T, and Verizon, the EMS as part of EVS 5.3.4.1 only supports the transmission of results via Verizon modems. During this test campaign, WEC staff successfully transmitted results in each county listed below using Verizon modems in each municipality. During this test campaign, the

strength of service ranged from two bars (lowest indicator level is zero) to five bars (highest indicator level). Election results packets were sent successfully at all service levels.

WEC staff conducted testing of EVS 5.3.4.1 in three counties: Columbia, Wood, and Marathon between November 15 and 20, 2019. In consultation with each county clerk, WEC staff selected three municipalities in each county to serve as locations for testing.[1] The municipalities were selected in part because of the strength of the wireless networks in the community, or lack thereof, and the municipal clerk's willingness to host the test team.

At its May 21, 2013, meeting, pursuant to authority granted in Wis. Stat. §5.91 and Wis. Admin. Code EL 7, the Government Accountability Board adopted testing procedures and standards pertaining to the modeming and communication functionality of voting systems that have not received EAC certification. The standards were based upon the analysis and findings outlined in a staff memorandum and detailed in the *Voting Systems Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices in Wisconsin*, which are attached as Appendix E. These rules apply to non-EAC certified voting systems, where the underlying voting system received EAC certification to either the 2002 Voting System Standards (VSS) or 2005 VVSG, but any additional modeming component does not meet the 2005 VVSG.

Ongoing Windows 7 Support

As detailed in the materials for the Commission's September 24, 2019 meeting, WEC staff have previously sought and obtained clarification regarding ES&S's plans to support customers utilizing the Windows 7 operating system after the system's projected end of life on January 14, 2020.

ES&S confirmed that only the client workstation laptop that houses the Election Management System utilizes the Windows 7 operating system and that none of the optical scan tabulators or accessible voting devices included in either the systems certified on September 24, EVS 6.0.4.0 and EVS 6.0.5.0, or the system detailed in this certification report, EVS 5.3.4.1, run on Windows 7.

Functional Testing

As required by Wis. Admin. Code EL § 7.02(1), WEC staff conducted three mock elections with each component of EVS 5.3.4.1 to ensure the voting system conforms to all Wisconsin requirements. These mock elections included: A partisan primary with a special nonpartisan school board election, a general election with both a presidential and special gubernatorial contest, and a presidential preference vote combined with a partisan Assembly Representative special election.

WEC staff designed a test deck of nearly 1,500 ballots using various configurations of votes over the three mock elections to verify the accuracy and functional capabilities of EVS 5.3.4.1. Using blank test ballots supplied by ES&S, WEC staff appropriately marked votes for contests and candidates as designated on a test deck spreadsheet. For each mock election, 300 paper ballots were marked to be fed through the DS200, DS450 and DS850. An additional 80 paper ballots were marked to test the write-in report function of the DS200. The functionality of the ExpressVote was tested by marking 250 ballots

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[1] Columbia County: Village of Cambria, City of Wisconsin Dells, Town of Dekorra
Wood County: Town of Hiles, Town of Grand Rapids, City of Marshfield
Marathon County: Village of Weston, Town of Marathon, Town of Wien

with the equipment across the three mock elections. This total includes 50 ballots for each mock election, plus 100 ExpressVote ballots that were marked as part of ExpressLink testing. The functionality of the AutoMark was tested by marking a total of 150 ballots, or 50 per election type.

The paper ballots marked, as well as the votes captured by the ExpressVote and AutoMark, were verified by WEC staff before being scanned and counted by the DS200, DS450, and DS850. WEC staff ensured that the results produced by the three pieces of equipment were accurate and reconciled with the test deck script prior to transitioning to test the next mock election type. A small number of results anomalies, explained below, were investigated and resolved in real time.

Votes were recorded on test ballots in a variety of configurations in all contests to ensure that the programming of the tabulation equipment was compatible with Wisconsin election law, and that the equipment processed ballot markings in accordance with statutory requirements. Ballots were purposefully marked with overvoted contests and the equipment was able to consistently identify those scenarios and inform the voter about the specific contest, or contests, that were problematic. Ballots for both the Partisan Primary and Presidential Preference mock elections were also marked with votes that crossed party lines and, in each instance, the machines were able to identify those crossover votes and display the warning screen to the voter. Two different ballot styles were used for each mock election and one ballot style in each election had a special election contest included on the ballot. This inclusion was used to determine if the equipment could be programmed to accommodate multiple election definitions on the same ballot style and produce accurate results. The equipment was found to have accurately tabulated votes and correctly reflected Wisconsin election law in the programming.

The test decks used for this campaign were also designed to determine what constitutes a readable mark by each piece of tabulation equipment included in this system. A subset of ballots in the test deck were marked using "special marks." The ballots with special marks were processed by the tabulation equipment. WEC staff reviewed the results to determine which of the special marks were read by the tabulation machines. The chart below illustrates actual marks from test deck ballots that were successfully read and counted as "good marks" by the DS200, DS450 and DS850.

Examples of Marks Read by the EVS 5.3.4.1 Components during Testing

Turanga Leela	William Adama	James T. Kirk	Roger Waters	Delta Walker
Philip J. Fry	Tom Zerek	Harry Mudd	David Gilmour	Susannah Dean
Uninstructed	Uninstructed	Uninstructed		

All three pieces of equipment were able to correctly read marks in pencil, black pen, blue pen, and red pen, as well as marks made with pens provided by ES&S. The test decks also included ballots folded to simulate absentee ballots and ballots with slight tears in them. Folded ballots were able to be processed on the DS200, DS450 and DS850. It is possible, however, for ballots with folds directly through the oval to create what is best described as a false positive. While all three pieces of equipment processed slightly torn ballots without incident, anything other than a slight tear was only able to be processed by the DS200. Ballots with large tears will cause a jam in both the DS450 and the DS850.

Blank ballots were also included to determine how each of the three different tabulators would treat these ballots. The DS200 was able to identify blank ballots and provide a warning message to the voter that indicated the ballot was blank and provide options to return the ballot or cast it as is. This

functionality was also tested on the DS450 or DS850, with the blank ballots diverted to a separate tray for election inspector review.

Ballots with write-in votes tabulated by the DS200 are marked by the tabulator with a small pink circle on one end of the ballot. Depending on the ballot box used, these ballots may or may not be diverted into a separate write-in bin. This voting system can also be configured to capture ballot images of ballots with write-ins and store them on the external USB flash drive, which would permit write-in votes to be easily verified within the ElectionWare EMS. For a more detailed review of the testing staff conducted to review the DS200's write-in report functionality, please see Appendix G.

Staff also conducted testing on the ExpressLink application and ballot style printer. The ExpressLink printer places a barcode on an ExpressVote ballot that, when inserted, automatically loads a voter's correct ballot style. To ensure that the ExpressLink printer functions appropriately, staff placed ballot style activation codes on 100 ExpressVote ballot cards, representing 10 ballot styles. These 100 ballot cards were then placed in the ExpressVote and marked according to a pre-set test script. Each of the 100 ExpressVote ballot cards that had been pre-printed with the ExpressLink ballot style activation codes loaded the corresponding ballot style correctly. Further detail on the testing protocol employed to test the ExpressLink functionality can be found in Appendix F.

Testing Anomalies

The majority of ballots in the test deck were processed without incident during the test campaign, but there were minimal anomalies identified. There were two instances in which a ballot with an erasure mark that was not captured by the DS850 or DS200 triggered an overvote on the DS450. An investigation of the cast vote record showed that the ovals containing the erasure appeared much darker when scanned by the DS450 tabulator than to the naked eye. Other test ballots that contained lighter erasure marks were treated uniformly by all three tabulators.

In a separate situation, a single ballot on which the contests were marked using green ink was incorrectly tabulated by the DS200. On the ballot, which contained a total of 5 votes in separate contests, all marked in green ink, 2 of the voted contests were not counted by the DS200 tabulator. The remaining 3 voted contests on the same ballot were counted as expected. In reviewing the ballot image and cast vote record, staff was able to determine that the green ink was not dark enough to create a pixel count higher than the minimum threshold of the equipment for the two contests in question.

Anomalies such as these are common during a testing campaign and are identified by the purposeful inclusion of ambiguous marks on test deck ballots. In both instances, voter behavior in marking the ballot (erasure smudge and the use of green ink) played a significant role in the disposition of those ballots by the voting equipment. Election day voter behavior notwithstanding, staff recommends that any returned absentee ballots containing erasure marks or contests marked with green ink be remade prior to processing on election day.

No anomalies that presented during testing affected the outcome in any way. All elections reconciled, as required. Testing results and staff observation of the system indicate that EVS 5.3.4.1 consistently identifies and tabulates correctly marked votes in a uniform fashion. The system is also flexible enough to correctly interpret special marks made within an oval while not considering resting or stray marks made outside of an oval.

Modem Testing

WEC staff conducted functional testing of EVS 5.3.4.1 in Columbia, Wood, and Marathon counties based on the *Voting Systems Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices in Wisconsin.* A four-person team of WEC staff conducted this testing campaign November 15-20, 2019. Two representatives from ES&S were on hand in each county to provide technical support. ES&S provided three (3) DS200s in each county, each equipped with a Verizon wireless modem. Also provided by ES&S as part of testing was a portable EMS environment, which included an SFTP client, firewall, and Electionware software. In each location, ES&S set up the portable environment in the county office to receive test election results from each municipal testing location. In each municipal location, WEC staff inserted a pre-marked package of 10 test ballots through the DS200 to create an election results packet to transmit to the county office. A WEC staff member was present at the county office to observe how the portable EMS environment handled the transmissions.

In previous test campaigns, staff tested both wireless and analog (wired) modems. Testing for EVS 5.3.4.1, however, was performed only with wireless modems, as there was no analog component in this system. As part of EVS 5.3.4.1, the unofficial results data is encrypted, digitally signed, and then transmitted via a further encrypted virtual private network (VPN) hosted by Verizon Wireless. Without the correct encryption key, the incoming data is prevented from reaching the EMS workstation.

Columbia County

On November 15, 2019, WEC staff conducted tests on the EVS 5.3.4.1 modem component in three municipalities: Village of Cambria, City of Wisconsin Dells, and Town of Dekorra. ES&S conducted pre-testing of the EVS 5.3.4.1 wireless modem component in Columbia County prior to WEC testing. A DS200 equipped with Verizon wireless modem was tested in all three municipalities. A test script was used to ensure that each machine conforms to the communications device standards and was able to transmit accurate election results data from the DS200 to the Election Management System.

Municipality	Type of Modem	Signal Strength
Village of Cambria	Wireless	3 bars
City of Wisconsin Dells	Wireless	3-4 bars
Town of Dekorra	Wireless	3 bars

WEC staff successfully transmitted election results from each of the three municipalities. The test script calls for the verification of several certification standards and then requires 10 results sets to be transmitted from each DS200. The machines were able to successfully transmit multiple results with a 100% success rate during this portion of testing. The functional testing concluded with a load test during which WEC staff attempted to transmit results simultaneously from all the machines for a set period of time. Each machine was able to transmit at least 17 results sets with 100% success during the 20-minute load test in Columbia County.

Location	Modem Type	Initial Transmission	Load Test Results
Village of Cambria	Wireless	10 of 10	17 of 17
City of Wisconsin Dells	Wireless	10 of 10	17 of 17
Town of Dekorra	Wireless	10 of 10	17 of 17
Totals		**30 of 30**	**51 of 51**

Wood County

On November 19, 2019, WEC staff conducted tests on the EVS 5.3.4.1 modem component in three municipalities: Town of Hiles, Town of Grand Rapids, and City of Marshfield. ES&S conducted pre-testing of the EVS 5.3.4.1 modem component in Wood County prior to WEC testing. A DS200 equipped with a Verizon wireless modem was tested in all three municipalities. The same test script that was used in Columbia County was again used during this portion of the test campaign.

Municipality	Type of Modem	Signal Strength
Town of Hiles	Wireless	2-4 bars
Town of Grand Rapids	Wireless	2-4 bars
City of Marshfield	Wireless	4 bars

WEC staff successfully transmitted election results from each of the three municipalities. The test script calls for the verification of several certification standards and then requires 10 results sets to be transmitted from the DS200. The three machines each were able to successfully transmit results with an 100% success rate during this portion of testing. The functional testing concluded with a load test where WEC staff attempted to transmit results simultaneously from all the machines for a set period of time and each machine was able to transmit at least 19 results set during the stress test with zero overall transmission failures.

Location	Modem Type	Initial Transmission	Load Test Results
Town of Hiles	Wireless	10 of 10	19 of 19
Town of Grand Rapids	Wireless	10 of 10	19 of 19
City of Marshfield	Wireless	10 of 10	21 of 21
Totals		**30 of 30**	**59 of 59**

Marathon County

On November 20, 2019, WEC staff conducted tests on the EVS 5.3.4.1 modem component in three municipalities: Village of Weston, Town of Marathon, and Town of Wien. ES&S conducted pre-testing of the EVS 5.3.4.1 modem component in Marathon County prior to WEC testing. A DS200 equipped with a Verizon wireless modem was tested in all three municipalities. The same test script that was used in Columbia and Wood Counties was again used during this portion of the test campaign.

Municipality	Type of Modem	Signal Strength
Village of Weston	Wireless	3 bars
Town of Marathon	Wireless	3-4 bars
Town of Wien	Wireless	1-3 bars

WEC staff successfully transmitted election results from each of the three municipalities using wireless modems. The test script calls for the verification of several certification standards and then requires 10 results sets to be transmitted from the DS200. The three machines each were able to transmit results sets during this portion of testing with a 100% rate of success. The functional testing concluded with a load test during which WEC staff attempted to transmit results simultaneously from all the machines for a set period of time and each machine was able to transmit at least 14 results set during the stress test with three transmission failures. These failures were due to intermittent lapses in signal strength at the most rural of the test municipalities (Town of Wien).

Location	Modem Type	Initial Transmission	Load Test Results
Village of Weston	Wireless	10 of 10	17 of 17
Town of Marathon	Wireless	10 of 10	19 of 19
Town of Wien	Wireless	10 of 10	14 of 17
Totals		**30 of 30**	**50 of 53**

As part of modem testing for EVS 5.3.4.1 staff experienced a single issue in Marathon County. Two tests were conducted in this county. One was for 3g modems on EVS 5.3.4.0 and the 4g VPN modems as part of EVS 5.3.4.1. When transitioning from EVS 5.3.4.0 to EVS 5.3.4.1, there were several initial transmission failures. This was due to the wireless router at the county office needing additional time to connect to the network. In an election day scenario, this would not be an issue as the county clerk would have the system up and running beginning in the morning.

Public Demonstration

A public demonstration of EVS 5.3.4.1 was held on November 13, 2019 from 4:00 p.m. to 5:00 p.m. at the WEC office in Madison. The public meeting is designed to allow members of the public the opportunity to use the voting system and to provide comment. There were no attendees at the public demonstration.

Wisconsin Elections Commission Voting Equipment Review Panel Meeting

In an effort to continue to solicit valuable feedback from local election officials and community advocates during the voting equipment approval process, the Wisconsin Elections Commission formed a Voting Equipment Review Panel. Wis. Admin. Code EL §7.02(2), permits the agency to use a panel of local election officials and electors to assist in the review of voting systems.

Five of the 25 invited participants attended the Voting Equipment Review Panel Meeting, which is composed of municipal and county clerks, representatives of the disability community, and advocates for the interests of the voting public. The meeting took place at the WEC office in Madison on November 13, 2019, from 2:00 p.m. to 3:30 p.m. ES&S provided a demonstration of EVS 5.3.4.1 with

attendees encouraged to test the equipment. The modeming component of EVS 5.3.4.1 was discussed but not demonstrated during the meeting. Comments and feedback from the Voting Equipment Review Panel meeting are included in Appendix H.

Statutory Compliance

Wis. Stat. §5.91 provides the following requirements voting systems must meet to be approved for use in Wisconsin. Please see the text below of each requirement and staff's analysis of the EVS 5.3.4.1 compliance with the standards.

§ 5.91 (1)
The voting system enables an elector to vote in secret.
Staff Analysis
The ES&S voting systems meet this requirement by allowing a voter to vote a paper ballot in the privacy of a voting booth or at the accessible voting station without assistance.

§ 5.91 (3)
The voting system enables the elector, for all elections, except primary elections, to vote for a ticket selected in part from the nominees of one party, and in part from nominees from other parties and write-in candidates
Staff Analysis
The ES&S voting systems allow voter to split their ballot among as many parties as they wish during any election that is not a partisan primary.

§ 5.91 (4)
The voting system enables an elector to vote for a ticket of his or her own selection for any person for any office for whom he or she may desire to vote whenever write-in votes are permitted.
Staff Analysis
The ES&S voting systems allow write-ins where permitted.

§ 5.91 (5)
The voting systems accommodate all referenda to be submitted to electors in the form provided by law.
Staff Analysis
The ES&S voting systems meet this requirement. Referenda included as part of testing were accurately tabulated by all EVS 5.3.4.1 components.

§ 5.91 (6)
The voting system permits an elector in a primary election to vote for the candidates of the recognized political party of his or her choice, and the system rejects any ballot on which votes are cast in the primary of more than one recognized political party, except where a party designation is made or

where an elector casts write-in votes for candidates of more than one party on a ballot that is distributed to the elector.
Staff Analysis
The ES&S voting systems can be configured to always reject crossover votes without providing an opportunity for the voter to override. The system can also be programmed to provide a warning screen to the voter that identifies any crossover voted contest. Either one of these programming options allows these systems to meet this requirement. The warning screen provides options where the voter can choose to have their ballot returned to them or they can cast the ballot without correcting the crossover vote. The use of the override function was previously prohibited by statute, but Wis. Stats. §5.85(2)(b) expressly allows for the optional use of the override function in event of an overvote and the WEC has applied the same standard to the use of the override function in the event of crossover vote.

§ 5.91 (7)
The voting system enables the elector to vote at an election for all persons and offices for whom and for which the elector is lawfully entitled to vote; to vote for as many persons for an office as the elector is entitled to vote for; to vote for or against any question upon which the elector is entitled to vote; and it rejects all choices recorded on a ballot for an office or a measure if the number of choices exceeds the number which an elector is entitled to vote for on such office or on such measure, except where an elector casts excess write-in votes upon a ballot that is distributed to the elector.
Staff Analysis
The ES&S voting systems can be configured to always reject overvotes without providing an opportunity for the voter to override. The system can also be programmed to provide a warning screen to the voter that identifies any overvoted contest. Either one of these programming options allows these systems to meet this requirement. The warning screen provides options where the voter can choose to have their ballot returned to them or they can cast the ballot without correcting the overvote. The use of the override function was previously prohibited by statute, but Wis. Stats. §5.85(2)(b) expressly allows for the optional use of the override function in event of an overvote.

§ 5.91 (8)
The voting system permits an elector at a General Election by one action to vote for the candidates of a party for President and Vice President or for Governor and Lieutenant Governor.
Staff Analysis
The ES&S voting systems meet this requirement. Traditional paper ballots utilized by the DS200, as well as the ExpressVote candidate screens, present the two candidates in these contests as a single choice.

§ 5.91 (9)
The voting system prevents an elector from voting for the same person more than once, except for excess write-in votes upon a ballot that is distributed to the elector.
Staff Analysis
The ES&S voting systems meet this requirement.

§ 5.91 (10)
The voting system is suitably designed for the purpose used, of durable construction, and is usable safely, securely, efficiently and accurately in the conduct of elections and counting of ballots.
Staff Analysis
The ES&S voting systems meet this requirement.

§ 5.91 (11)
The voting system records and counts accurately every vote and maintains a cumulative tally of the total votes cast that is retrievable in the event of a power outage, evacuation or malfunction so that the records of votes cast prior to the time that the problem occurs is preserved.
Staff Analysis
The ES&S voting systems meet this requirement.

§ 5.91 (12)
The voting system minimizes the possibility of disenfranchisement of electors as the result of failure to understand the method of operation or utilization or malfunction of the ballot, voting system, or other related equipment or materials.
Staff Analysis
The ES&S voting systems can be programmed to provide warning screens to the voter that identifies any problem with their ballot. The warning screens provide an explanation of the problem and allow the voter to have their ballot returned to them to review and correct the error. The systems can be configured to always reject overvotes and crossover votes without providing an opportunity for the voter to override.

§ 5.91 (13)
The automatic tabulating equipment authorized for use in connection with the system includes a mechanism which makes the operator aware of whether the equipment is malfunctioning in such a way that an inaccurate tabulation of the votes could be obtained.
Staff Analysis
The ES&S voting systems meet this requirement.

§ 5.91 (14)
The voting system does not use any mechanism by which a ballot is punched or punctured to record the votes cast by an elector.
Staff Analysis
The ES&S system does not use any such mechanism to record votes.
§ 5.91 (15)
The voting system permits an elector to privately verify the votes selected by the elector before casting his or her ballot.
Staff Analysis
The ES&S voting systems meet this requirement through the use of hand-marked paper ballots and accessible voting equipment that provides both an electronic ballot review screen and a marked paper ballot that can be reviewed before tabulation.

§ 5.91 (16)
The voting system provides an elector the opportunity to change his or her votes and to correct any error or to obtain a replacement for a spoiled ballot prior to casting his or her ballot.
Staff Analysis
The ES&S voting systems meet this requirement. Traditional paper ballots can be changed and/or spoiled at any point up to being placed in the tabulator. ExpressVote ballots are printed for the voter to review prior to casting in a tabulator and can be spoiled at will by the voter.

§ 5.91 (17)
Unless the ballot is counted at a central counting location, the voting system includes a mechanism for notifying an elector who attempts to cast an excess number of votes for a single office the ballot will not be counted, and provides the elector with an opportunity to correct his or her ballot or to receive a replacement ballot.
Staff Analysis
The ES&S voting systems can be programmed to provide warning screens to the voter that identifies any problem with their ballot. The warning screens provide an explanation of the problem and allow the voter to have their ballot returned to them to review and correct the error. The systems can be configured to always reject overvotes and crossover votes without providing an opportunity for the voter to override.

§ 5.91 (18)
If the voting system consists of an electronic voting machine, the voting system generates a complete, permanent paper record showing all votes cast by the elector, that is verifiable by the elector, by either visual or nonvisual means as appropriate, before the elector leaves the voting area, and that enables a manual count or recount of each vote cast by the elector.
Staff Analysis

> Since the ES&S voting systems presented for approval require paper ballots to be used to cast votes, this requirement is satisfied.

The Help America Vote Act of 2002 (HAVA) also provides the following applicable requirements that voting systems must meet:

HAVA § 301(a)(1)(A)
The voting system shall:
(i) permit the voter to verify (in a private an independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted;
(ii) provide the voter with the opportunity (in a private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error); and
(iii) if the voter selects votes for more than one candidate for a single office –   (I) notify the voter than the voter has selected more than one candidate for a single office on the ballot;   (II) notify the voter before the ballot is cast and counted of the effect of casting multiple votes for the office; and,   (III) provide the voter with the opportunity to correct the ballot before the ballot is cast and counted
HAVA § 301(a)(1)(C)
The voting system shall ensure than any notification required under this paragraph preserves the privacy of the voter and the confidentiality of the ballot.
HAVA § 301(a)(3)(A)
The voting system shall—   (A) be accessible for individuals with disabilities, including nonvisual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as other voters
Staff Analysis
The ES&S voting system components meet these requirements through the inclusion of options for ADA-compliant voting machines municipalities can choose to employ.

Recommendations

Staff has reviewed the application materials, including the technical data package and testing lab report, and examined the results from the functional and modeming test campaigns to determine if these systems are compliant with both state and federal certification laws. EVS 5.3.4.1 complies with all applicable state and federal requirements. The voting system components met all standards over three mock elections and staff determined they can successfully run a transparent, fair, and secure election in compliance with Wisconsin Statutes. The system also enhances access to the electoral process for individuals with disabilities with the inclusion of the ExpressVote and AutoMark vote capture systems.

1. WEC staff recommends approval of ES&S voting system EVS 5.3.4.1 and components set forth in Appendix A of this report, as described below in item 3. This voting system accurately completed the three mock elections and was able to accommodate the voting requirements of the Wisconsin election process. This recommendation is based on the VSTL report provided by Pro V&V and on this voting system successfully completing a functional test according to the *Voting Systems Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices in Wisconsin*.

2. WEC staff recommends approval of the ExpressLink application software and ballot style printer as part of the WEC's approval. While this product lacks EAC certification, the component performed successfully when evaluated under a Commission approved test protocol.

3. WEC staff recommends that as a continuing condition of the WEC's approval, ES&S may not impose customer deadlines contrary to requirements provided in Wisconsin Statutes, as determined by the WEC. In order to enforce this provision, local jurisdictions purchasing ES&S equipment shall also include such a provision in their respective purchase contract or amend their contract if such a provision does not currently exist.

4. WEC staff recommends that as a continuing condition of the WEC's approval, that voting systems purchased and installed as part of EVS 5.3.4.1 be configured in the same manner in which they were tested, subject to verification by the Commission or its designee. Once installed, the configuration must remain the same and may not be altered by ES&S nor by state, county, or municipal officials except as approved by the Commission.

5. WEC staff recommends that as a continuing condition of the WEC's approval, that this system must always be configured to include the following options:

   a. Automatic rejection of crossover and overvoted ballots with or without the option to override.
   b. Automatic rejection of all improper ballots except blank ballots.
   c. Digital ballot images to be captured for all ballots tabulated by the system.

6. As part of this WEC certification, only equipment included in this certificate can be used together to conduct an election in Wisconsin. Previous system versions that were approved for use by the WEC, former Elections Board, or the former G.A.B. are not compatible with EVS 5.3.4.1 and are not to be used in conjunction with the equipment components of EVS 5.3.4.1 as submitted for approval. If a jurisdiction upgrades to EVS 5.3.4.1, it needs to upgrade each and every component of the voting system to the requirements of what is approved herein.

7. As part of this WEC certification, ES&S agrees to provide extended Windows 7 support through January of 2023 at no cost to any Wisconsin purchasing entity.

8. WEC staff recommends that as a condition of approval, ES&S shall abide by applicable Wisconsin public records laws. If, pursuant to a proper public records request, the customer receives a request for matters that might be proprietary or confidential, customer will notify ES&S, providing the same with the opportunity to either provide customer with the record that is requested for release to the requestor, or shall advise customer that ES&S objects to the release of the information, and provide the legal and factual basis of the objection. If for any reason, the customer concludes that customer is obligated to provide such records, ES&S shall provide such records immediately upon customer's request. ES&S shall negotiate and specify retention and public records production costs in writing with customers prior to charging said fees. In absence of meeting such conditions of approval, ES&S shall not charge customer for work performed pursuant to a proper public records request, except for the "actual, necessary, and direct" charge of responding to the records request, as that is defined and interpreted in Wisconsin law, plus shipping, handling, and chain of custody.

9. The Wisconsin application for approval contains a condition that requires the vendor to reimburse the WEC for all costs associated with the testing campaign and certification process. ES&S agreed to this requirement on the applications submitted to WEC on July 17, 2019 requesting the approval of EVS 5.3.4.1.

A. **Proposed Motion**

MOTION: The Wisconsin Elections Commission adopts the staff's recommendations for approval of the ES&S voting system's Application for Approval of EVS 5.3.4.1, including the conditions described above.

Appendices

- Appendix A: Hardware and Software Components
- Appendix B: Wisconsin Statutes § 5.91
- Appendix C: Wisconsin Administrative Code Ch. EL 7
- Appendix D: Voting System Test Laboratory Report
- Appendix E: *Voting Systems Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices in Wisconsin*
- Appendix F: ExpressLink Testing Protocol
- Appendix G: DS200 Write-In Report Pilot Test Protocol
- Appendix H: Wisconsin Voting Equipment Review Panel Feedback

Appendix A: Hardware and Software Components

ES&S submitted the following equipment for testing as part of EVS 5.3.4.1:

Hardware Components

Equipment	Hardware Version(s)	Firmware Version	Type
DS200	1.2 1.3, 1.3.11	2.12.6.0	Polling Place Digital Scanner and Tabulator
DS450	1.0	3.0.2.0	Mid-range Digital Scanner and Tabulator
DS850	1.0	2.10.4.0	High-speed Digital Scanner and Tabulator
AutoMARK	1.0 1.1 1.3	1.8.6.1	ADA Ballot Marking Device
ExpressVote HW 1.0	1.0	1.4.1.7	Universal Voting System
ExpressVote HW 2.1	2.1.0.0 2.1.2.0	2.4.2.0	Hybrid Universal Voting System and precinct count tabulator

Software Components

Software	Type
ElectionWare	4.7.6.0
ES&S Event Logging Service (ELS)	1.5.5.0
ExpressVote Previewer (HW 1.0)	1.4.1.7
ExpressVote Previewer (HW 2.1)	2.4.2.0
ExpressLink	1.5.0.0
AutoMARK VAT Previewer	1.8.6.1
Removable Media Service (RMS)	1.4.5.0

Appendix B: Wis. Stat. § 5.91

5.91 Requisites for approval of ballots, devices and equipment. No ballot, voting device, automatic tabulating equipment, or related equipment and materials to be used in an electronic voting system may be utilized in this state unless it is certified by the commission. The commission may revoke its certification of any ballot, device, equipment, or materials at any time for cause. The commission may certify any such voting device, automatic tabulating equipment, or related equipment or materials regardless of whether any such item is approved by the federal election assistance commission, but the commission may not certify any ballot, device, equipment, or material to be used in an electronic voting system unless it fulfills the following requirements:

(1) It enables an elector to vote in secrecy and to select the party for which an elector will vote in secrecy at a partisan primary election.

(3) Except in primary elections, it enables an elector to vote for a ticket selected in part from the nominees of one party, and in part from the nominees of other parties, and in part from independent candidates and in part of candidates whose names are written in by the elector.

(4) It enables an elector to vote for a ticket of his or her own selection for any person for any office for whom he or she may desire to vote whenever write-in votes are permitted.

(5) It accommodates all referenda to be submitted to the electors in the form provided by law.

(6) The voting device or machine permits an elector in a primary election to vote for the candidates of the recognized political party of his or her choice, and the automatic tabulating equipment or machine rejects any ballot on which votes are cast in the primary of more than one recognized political party, except where a party designation is made or where an elector casts write-in votes for candidates of more than one party on a ballot that is distributed to the elector.

(7) It permits an elector to vote at an election for all persons and offices for whom and for which the elector is lawfully entitled to vote; to vote for as many persons for an office as the elector is entitled to vote for; to vote for or against any question upon which the elector is entitled to vote; and it rejects all choices recorded on a ballot for an office or a measure if the number of choices exceeds the number which an elector is entitled to vote for on such office or on such measure, except where an elector casts excess write-in votes upon a ballot that is distributed to the elector.

(8) It permits an elector, at a presidential or gubernatorial election, by one action to vote for the candidates of a party for president and vice president or for governor and lieutenant governor, respectively.

(9) It prevents an elector from voting for the same person more than once for the same office, except where an elector casts excess write-in votes upon a ballot that is distributed to the elector.

(10) It is suitably designed for the purpose used, of durable construction, and is usable safely, securely, efficiently and accurately in the conduct of elections and counting of ballots.

(11) It records correctly and counts accurately every vote properly cast and maintains a cumulative tally of the total votes cast that is retrievable in the event of a power outage, evacuation or malfunction so that the records of votes cast prior to the time that the problem occurs is preserved.

(12) It minimizes the possibility of disenfranchisement of electors as the result of failure to understand the method of operation or utilization or malfunction of the ballot, voting device, automatic tabulating equipment or related equipment or materials.

(13) The automatic tabulating equipment authorized for use in connection with the system includes a mechanism which makes the operator aware of whether the equipment is malfunctioning in such a way that an inaccurate tabulation of the votes could be obtained.

(14) It does not employ any mechanism by which a ballot is punched or punctured to record the votes cast by an elector.

(15) It permits an elector to privately verify the votes selected by the elector before casting his or her ballot.

(16) It provides an elector with the opportunity to change his or her votes and to correct any error or to obtain a replacement for a spoiled ballot prior to casting his or her ballot.

(17) Unless the ballot is counted at a central counting location, it includes a mechanism for notifying an elector who attempts to cast an excess number of votes for a single office that his or her votes for that office will not be counted, and provides the elector with an opportunity to correct his or her ballot or to receive and cast a replacement ballot.

(18) If the device consists of an electronic voting machine, it generates a complete, permanent paper record showing all votes cast by each elector, that is verifiable by the elector, by either visual or nonvisual means as appropriate, before the elector leaves the voting area, and that enables a manual count or recount of each vote cast by the elector.

History: 1979 c. 311; 1983 a. 484; 1985 a. 304; 2001 a. 16; 2003 a. 265; 2005 a. 92; 2011 a. 23, 32; 2015 a. 118 s. 266 (10); 2015 a. 261; 2017 a. 365 s. 111.

Cross-reference: See also ch. EL 7, Wis. adm. code.

Appendix C: Wis. Admin. Code Ch. EL 7

Chapter EL 7

APPROVAL OF ELECTRONIC VOTING EQUIPMENT

EL 7.01 Application for approval of electronic voting system.
EL 7.02 Agency testing of electronic voting system.
EL 7.03 Continuing approval of electronic voting system.

Note: Chapter ElBd 7 was renumbered chapter GAB 7 under s. 13.92 (4) (b) 1., Stats., and corrections made under s. 13.92 (4) (b) 7., Stats., Register April 2008 No. 628. **Chapter GAB 7 was renumbered Chapter EL 7 under s. 13.92 (4) (b) 1., Stats., Register June 2016 No. 726.**

EL 7.01 Application for approval of electronic voting system.

(1) An application for approval of an electronic voting system shall be accompanied by all of the following:
(a) A signed agreement that the vendor shall pay all costs, related to approval of the system, incurred by the elections commission, its designees and the vendor.
(b) Complete specifications for all hardware, firmware and software.
(c) All technical manuals and documentation related to the system.
(d) Complete instruction materials necessary for the operation of the equipment and a description of training available to users and purchasers.
(e) Reports from an independent testing authority accredited by the national association of state election directors (NASED) demonstrating that the voting system conforms to all the standards recommended by the federal elections commission.
(f) A signed agreement requiring that the vendor shall immediately notify the elections commission of any modification to the voting system and requiring that the vendor will not offer, for use, sale or lease, any modified voting system, if the elections commission notifies the vendor that the modifications require that the system be approved again.
(g) A list showing all the states and municipalities in which the system has been approved for use and the length of time that the equipment has been in use in those jurisdictions.
(2) The commission shall determine if the application is complete and, if it is, shall so notify the vendor in writing. If it is not complete, the elections commission shall so notify the vendor and shall detail any insufficiencies.
(3) If the application is complete, the vendor shall prepare the voting system for three mock elections, using offices, referenda questions and candidates provided by the elections commission.

History: Cr. Register, June, 2000, No. 534, eff. 7−1−00; **correction in (1) (a), (f),**

(2), (3) made under s. 13.92 (4) (b) 6., Stats., Register June 2016 No. 726.

EL 7.02 Agency testing of electronic voting system.
(1) The elections commission shall conduct a test of a voting system, submitted for approval under s. EL 7.01, to ensure that it meets the criteria set out in s. 5.91, Stats. The test shall be conducted using a mock election for the partisan primary, a mock general election with both a presidential and gubernatorial vote, and a mock nonpartisan election combined with a presidential preference vote.
(2) The elections commission may use a panel of local election officials and electors to assist in its review of the voting system.
(3) The elections commission may require that the voting system be used in an actual election as a condition of approval.
History: Cr. Register, June, 2000, No. 534, eff. 7−1−00; **correction in (1) to (3) made under s. 13.92 (4) (b) 6., Stats., and correction in (1) made under s. 13.92 (4) (b) 7., Stats., Register June 2016 No. 726.**

EL 7.03 Continuing approval of electronic voting system.

(1) The elections commission may revoke the approval of any existing electronic voting system if it does not comply with the provisions of this chapter. As a condition of maintaining the elections commission's approval for the use of the voting system, the vendor shall inform the elections commission of all changes in the hardware, firmware and software and all jurisdictions using the voting system.
(2) The vendor shall, at its own expense, furnish, to an agent approved by the elections commission, for placement in escrow, a copy of the programs, documentation and source code used for any election in the state.
(3) The electronic voting system must be capable of transferring the data contained in the system to an electronic recording medium, pursuant to the provisions of s. 7.23, Stats.
(4) The vendor shall ensure that election results can be exported on election night into a statewide database developed by the elections commission.
(5) For good cause shown, the elections commission may exempt any electronic voting system from strict compliance with this chapter.

History: Cr. Register, June, 2000, No. 534, eff. 7−1−00; **correction in (1), (4), (5) made under s. 13.92 (4) (b) 6., Stats. and corrections in (5) made under s. 13.92 (4) (b) 7., Stats., and s. 35.17, Stats., Register June 2016 No. 726.**

Appendix D: Voting System Test Laboratory Test Report

PRO V&V

Test Report

Election Systems & Software (ES&S)
Voting System (EVS) 5.3.4.1
Certification Testing

Approved by: _Diane Gray_
for Michael Walker, VSTL Project Manager

Approved by: _Wendy Owens_
Wendy Owens, VSTL Program Manager

July 2, 2019

1.0   INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to perform testing on the Election Systems and Software (ES&S) Voting System EVS 5.3.4.1 (EVS 5.3.4.1) to the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0.

1.1   References

The documents listed below were utilized in the development of this Test Report:

- ES&S Voting System EVS 5.3.4.1 System Change Notes, Document Revision 1.0

- Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, "Voting System Performance Guidelines", and Volume II, "National Certification Testing Guidelines"

- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2016 Edition, "NVLAP Procedures and General Requirements (NIST Handbook 150)", dated July 2016

- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2017 Edition, "Voting System Testing (NIST Handbook 150-22-2017)", dated July 2017

- Pro V&V, Inc. Quality Assurance Manual, Revision 7.0

- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002

- Election Assistance Commission Testing and Certification Program Manual, Version 2.0

- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0

- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)

- EAC Notices of Clarification (NOC) (listed on www.eac.gov)

- ES&S Voting System EVS 5.3.4.1 Technical Data Package *(A listing of the TDP documents submitted for this test campaign is included in Section 3.3.1 of this Test Report)*

1.2   Terms and Abbreviations

"ADA" –Americans with Disabilities Act "BMD"

– Ballot Marking Device

"CBT" – Central Ballot Tabulator

"COTS" – Commercial Off-The-Shelf "DRE"

– Direct Record Electronic

"EAC" – Election Assistance Commission "EMS"

– Election Management System

"ERM" – Election Reporting Manager

"ES&S" Election Systems & Software LLC "FCA"

– Functional Configuration Audit

"HAVA" – Help America Vote Act

"PCA" – Physical Configuration Audit "PBT" –

Precinct Ballot Tabulator

"TDP" – Technical Data Package "UVS" –

Universal Voting System "VAT" – Voter

Assist Terminal

"VVSG" – Voluntary Voting System Guidelines

1.3   Description of Modification

ES&S's EVS 5.3.4.1 Voting System (EVS 5.3.4.1) is based on the previously VSTL-certified EVS 5.2.4.1 (which was baselined from the EAC-certified EVS 5.2.4.0). Specific updates focused on telecommunications capabilities and write-in support. This release includes support for Presidential Preference Primary (PPP) voting, including the ability to process overvotes and undervotes on the DS200 with the new PPP contest type.

ES&S has identified the following modifications which are incorporated into the EVS 5.3.4.1 system: Detailed

Description of Changes

Software/Firmware Changes:

- Cross-Product Changes

    The following changes were made across multiple products as part of this release:

    o Telecommunication Support

        ─ Impacted Products: DS200, Electionware

            ▪ Added support for modeming.

- DS200

o Write-In Support

- Changed the Write-in Review report to sort write-ins by precinct.

- Revised the Write-In Review report to suppress contests with no entered write-in votes. This will save space on the report and avoid wasting report tape.

1.4 Scope of Testing

Pro V&V performed an evaluation of the results from the previous test campaign along with the changes made to the system to determine the scope of testing required for the submitted modification. It was determined the following tasks would be required to verify compliance of the VVPAT:

- Technical Data Package (TDP) Review

  A limited TDP Review was performed to ensure that all submitted modifications were accurately documented and that the documents meet the requirements of the EAC VVSG, Version 1.0.

- Physical Configuration Audit (PCA), including Security Testing

  A PCA was performed to compare the voting system submitted for certification testing to the manufacturer's technical documentation.

- Source Code Review, Compliance Build, Trusted Build, and Build Document Review

  The source code review was based on the source code changes made since the previous system was certified.

  Build document review was performed to ensure that all required equipment and software were current during the building process. A compliance build was created after the reviews. Once the integrity of the compliance build was verified, the trusted build was created.

- Accuracy Testing

  The Accuracy Test was performed to ensure the EVS 5.3.4.1 correctly captured, stored, consolidated, and reported the specific ballot selections, and absence of selections, for each ballot position.

- Telecommunications Testing

  Telecommunications testing was conducted on the EVS 5.3.4.1 to determine the capability of the system to transmit and receive data electronically using hardware and software components over distances both within and external to a polling place. All telecommunications were tested using the Verizon Private Network, or Zero Tunnel. The DS200 utilized the Verizon 4R.2 modem. *Additional data transmissions used to operate a voting system in the conduct of an election but not explicitly listed in the VVSG are also subject to the requirements of this section. For systems that transmit data using public networks, this section applies to telecommunications*

hardware and software for transmissions within and among all combinations of senders and receivers located at polling places, precinct count facilities and central count facilities (whether operated by the jurisdiction or a contractor).

2.0 TESTING OVERVIEW

The evaluation of EVS 5.3.4.1 was designed to verify that certain features and applications, which have been modified from the certified baseline system, conform to the applicable EAC VVSG 1.0 requirements. The evaluation addressed each of the test goals in the following manner:

Table 1-1: Testing Overview

Test Goal	Testing Response
Perform Source Code Review of any modified source code, generate Trusted Builds, and perform a Build Documentation Review	Trusted Builds were generated for the EVS 5.3.4.1 components during the test campaign. The source code submitted by ES&S was reviewed by Pro V&V and was successfully built using the submitted COTS and third-party software products. Additionally, build documentation was reviewed.
Perform System Setup, Loads, and Hardening	The system setup, loads, and hardening was tested by comparing the voting system submitted for certification testing to the manufacturer's technical documentation.
Accuracy Testing (including Telecommunication Testing)	Accuracy Testing was performed to verify that the voting system components could accurately process ballot selections, transmit selections back to the EMS, and produce accurate totals.

Table 1-1: Testing Overview *(continued)*

Test Goal	Testing Response
System Integration (including FCA and Telecommunications Testing)	System Integration and FCA testing were conducted to verify system functionality.

Telecommunications Testing	Telecommunications testing was conducted on the EVS 5.3.4.1 to determine the capability of the system to transmit and receive data electronically using hardware and software components over distances both within and external to a polling place.
Perform PCA & Receipt Inspection	A PCA and Receipt Inspection were performed to compare the voting system components and materials submitted for testing against the manufacturer's technical documentation.

2.0 Test Candidate

A description of the system tested, as taken from the manufacturer's submitted technical documentation, is provided in the paragraphs below.

EVS 5.3.4.1 includes the following hardware: ExpressVote Universal Voting System (UVS), Hardware 1.0, ExpressVote Universal Voting System (UVS), Hardware 2.1, AutoMARK Voter Assist Terminal (VAT), DS200 Precinct Ballot Tabulator (PBT), DS450 Central Ballot Tabulator (CBT), and the DS850 Central Ballot Tabulator (CBT).

ExpressVote Universal Voting System

The ExpressVote Universal Voting System is a universal vote capture device, with independent voter- verifiable paper record that is digitally scanned for tabulation. This system combines paper-based voting with touch screen technology. The ExpressVote is designed to serve all voters, including those with special needs. Voters navigate ballot selections using the touch screen, detachable ADA keypad, or ADA support peripheral such as a sip-and-puff or other binary tactile device.

The ExpressVote includes a mandatory vote summary screen that requires voters to confirm or revise selections prior to printing the summary of ballot selections using the internal thermal printer. Once printed, ES&S ballot scanners process the vote summary card. The ExpressVote serves those with special needs, allowing voters to cast ballots autonomously. ES&S has fully integrated the ExpressVote with the existing suite of ES&S voting system products.

DS200 Precinct Ballot Tabulator

The DS200 is a paper-based precinct tabulator that scans voter selections from both sides of the ballot simultaneously. It has a large touch screen for voter communication, an integrated thermal printer for limitless Election Day printing, an easy-to-use interface and an internal battery pack for reliable power in the event of a power outage. The DS200 can scan a variety of ballot sizes, including vote summary cards.

DS450 Scanner and Tabulator

The DS450 is a high-throughput scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card. The DS450 reads ballots in any of four orientations and sorts tabulated ballots into

discrete output bins without interrupting scanning. A dedicated audit printer generates a continuous event log. Machine level reports are produced from a second, laser printer. The scanner saves voter selections and ballot images to an internal hard disk and exports results to a USB flash drive for processing with ERM. Optionally, this device may be configured to transmit tabulation results to the results server through a closed network connection rather than using physically transported USB flash drives.

DS850 Central Ballot Tabulator

The DS850 is a digital scan central ballot tabulator that uses cameras and imaging algorithms to capture voter selections on the front and back of a ballot, evaluate results and then sort ballots into discrete bins without interrupting scanning. A dedicated audit printer generates a continuous event log. Machine level reports are produced from a second, laser printer. The scanner saves voter selections and ballot images to an internal hard disk and exports results to a USB flash drive for processing with ERM. Optionally, this device may be configured to transmit tabulation results to the results server through a closed network connection rather than using physically transported USB flash drives.

AutoMARK Voter Assist Terminal

AutoMARK Voter Assist Terminal enables voters who are visually or physically impaired and voters more comfortable reading or hearing instructions and choices in an alternative language to privately mark optical scan ballots. The AutoMARK supports navigation through touch screen, physical keypad or ADA support peripheral such as a sip and puff device or binary tactile device.
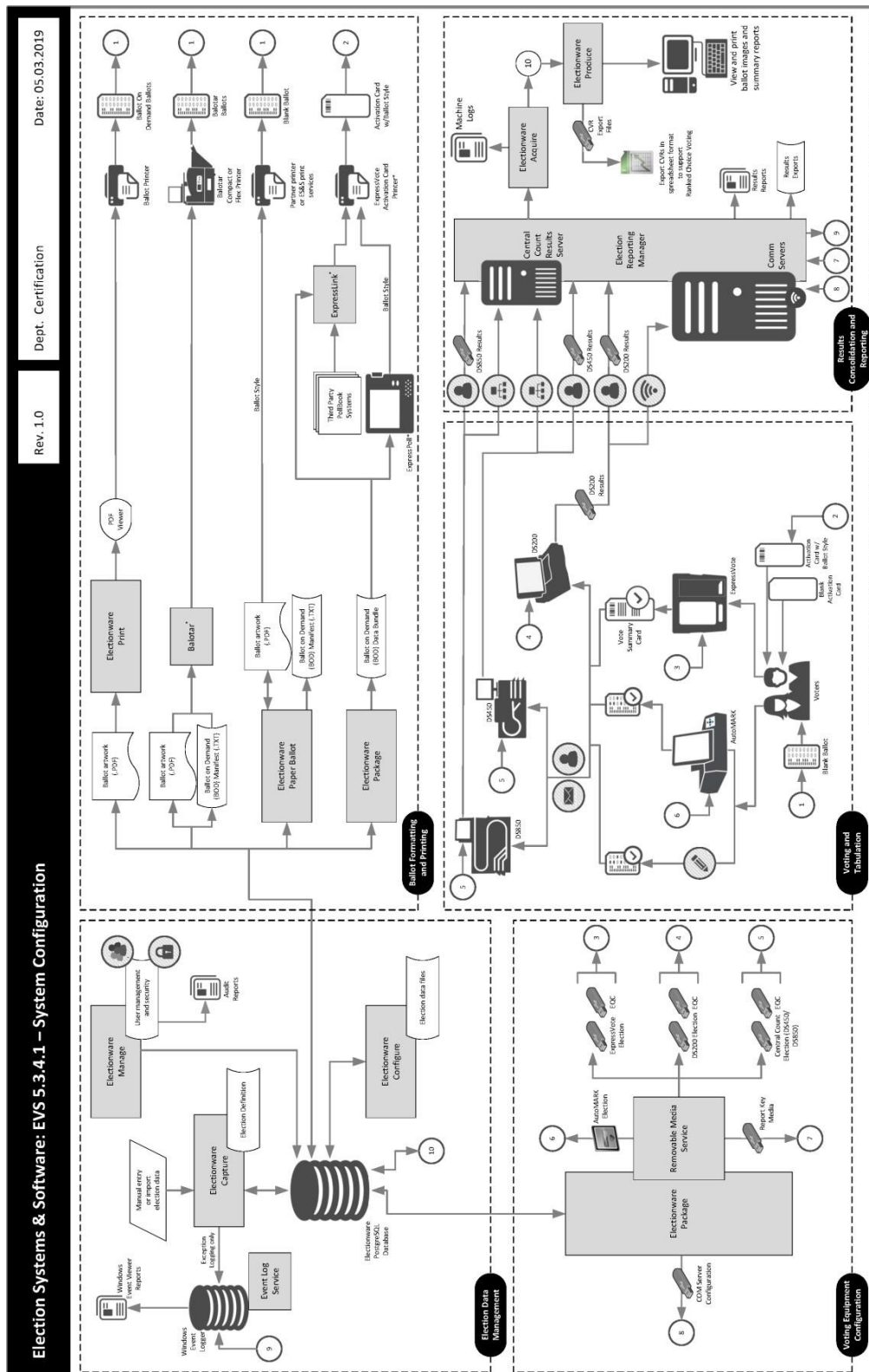
Figure 2.1 Voting System Overview

Table 2-1 lists the software components of the EVS 5.3.4.1 that were evaluated during testing.

Table 2-1: EVS 5.3.4.1 System Components

System Component	Software or Firmware Version	Hardware Version(s)	Description
ExpressVote HW 1.0	1.4.1.7	1.0	Universal Voting System
ExpressVote HW 2.1	2.4.2.0	2.1.0.0 2.1.2.0	Universal Voting System
ExpressVote Rolling Kiosk	---	1.0	Portable voting booth
Thermal Printer	LTPD-347B	---	Thermal report printer
ExpressVote Voting Booth	---	---	Stationary voting booth
Quad ExpressCart	---	---	Portable voting booth
Voting Booth Workstation	---	---	Stationary voting booth
MXB ExpressVote Voting Booth	---	---	Stationary voting booth
ExpressVote Double Table	---	---	Voting table for two units
ExpressVote Single Table	---	---	Voting table for one unit
ADA Table	---	---	Voting table
DS200	2.12.6.0	1.2, 1.3, 1.3.11	Precinct ballot tabulator
DS200 Ballot Box	---	1.2, 1.3, 1.4, 1.5	Plastic Ballot Box
DS200 Ballot Box	---	1.0, 1.1, 1.2	Metal Ballot Box
DS200 Ballot Box	---	1.0, 1.1	Collapsible Ballot Box
DS200 Tote Bin	---	---	Tote Bin Ballot Box
DS450	3.0.2.0	1.0	Central Count Scanner and Tabulator
DS450 Cart	---	---	---
DS850	2.10.4.0	1.0	Ballot Marking Device
DS850 Cart	---	---	---
HP Inkjet Ink Cartridge	---	---	Ink cartridge for ballot number imprinting
Auto MARK A100	1.8.6.1	1.0	ADA Ballot Marking Device
AutoMARK A200	1.8.6.1	1.1, 1.3	ADA Ballot Marking Device
AutoMARK A300	1.8.6.1	1.3	ADA Ballot Marking Device
AutoMARK Table	---	---	Voting table for one unit
Electionware	4.7.6.0	---	---
Election Reporting Manager (ERM)	8.12.1.6	---	---
ES&S Event Log Service	1.5.5.0	---	---
AutoMARK VAT Previewer	1.8.6.1	---	---
ExpressVote Previewer	1.4.1.7 (1.0) 2.4.2.0 (2.1)	---	---
Removable Media Service	1.4.5.0	---	---

Table 2-1: EVS 5.3.4.1 System Components *(continued)*

System Component	Software or Firmware Version	Hardware Version(s)	Description
SecureSetup	2.0.0.1		Proprietary Hardening Script
EMS Server	---	Dell PowerEdge T430	Election database creation, media programming and ballot image management
EMS SFTP Server	---	Dell PowerEdge T310	Secure Server used for modeming results
EMS Client Workstation	---	Dell OptiPlex 5050	Election database creation, media programming and ballot image management
Firewall	9.1.7, 9.9.2	Cisco ASA 5505 or 5506-X	Security Appliance for modeming
Router	---	CradlePoint AER1600LPA	Secure Router for modeming
Delkin: USB Flash Drive	---	512MB, 1 GB, 2 GB, 4 GB, 8 GB	Election and ballot definition media
Delkin: Validation USB Flash Drive	---	16 GB	Validation purposes only
Delkin: Compact Flash	---	1 GB	Election and ballot definition media
SanDisk: Compact Flash	---	512 MB, 1 GB, 2 GB	Election and ballot definition media
Delkin: CF Card Reader/Writer	---	6381	Device used to burn firmware media
SanDisk: CF Card Reader	---	018-6305	---
Headphones	---	AVID 86002	ExpressVote & AutoMARK headphones
Scanner (Zebra)	---	DS457-SR20009	QR Code Scanner (Integrated)
Scanner (Symbol)	---	DS9208	QR Code Scanner (External)
DS450 Report Printer	---	Dell S2810dn, OKI B432DN	Laser report printers
DS850 Report Printer	---	OKI B431D, OKI B431DN & OKI B432DN	Laser report printer
DS450 and DS850 Audit Printer	---	OKI Microline 420	Laser report printer
DS450 UPS	---	APC Back-UPS Pro 1500 or Smart-UPS 1500	---

Table 2-1: EVS 5.3.4.1 System Components *(continued)*

System Component	Software or Firmware Version	Hardware Version(s)	Description

DS450 Surge Protector	---	Tripp Lite Spike Cube	---
DS850 UPS	---	APC Back-UPS RS 1500 or Pro 1500	---
Adobe Acrobat Standard	11	---	---
Cerberus FTP	10.0.9 (64-bit)	---	---
Microsoft Server 2008	R2 w/SP1	---	Operating System for EMS and results servers
Microsoft Windows 7 Professional	64-bit/SP1	---	Operating System for client workstations
WSUS Microsoft Windows Offline Update Utility	11.6.1	---	Software updates (Update utility)
Micro Focus RM/COBOL Runtime	12.06	---	---
WS-FTP Professional	12.7.0	---	File transfer client software
Microsoft .NET	3.5	---	.NET framework
Kiwi Syslog Server	9.6.7		Manages system messages
Symantec Endpoint Protection	14.2.0_MP1 (64-bit)	---	Anti-Virus
Symantec Endpoint Protection Intelligent Updater (File-Based Protection)	20190404-001-core15sdsv5i64.exe	---	Anti-Virus
Symantec Endpoint Protection Intelligent Updater (Network-Based Protection)	20190403-061-IPS_IU_SEP_14RU1.exe	---	Anti-Virus
Symantec Endpoint Protection Intelligent Updater (Behavior-Based Protection)	20190401-001-SONAR_IU_SEP.exe	---	Anti-Virus
Visual C++ Redistributable	vcredist_x86.exe	---	Visual C++ 2010 Redistributable

Table 2-2 provides the hardware components of the EVS 5.3.4.1 that were evaluated during this test effort.
Table 2-2: Hardware Components

EVS 5.3.4.1 System Component	Serial Number(s)
Dell Optiplex 5050	Service Tag: 1JJB1S2
Dell Power Edge T430	Service Tag: 2KV30W2
Dell Power Edge T310	Service Tag: 2MQLQW1
Cisco ASA 5505	JMX1717Z0LV
Cisco ASA 5506	JMX2203G32U
CradlePoint AER1600LPA	MM190190900640
OKI B431d	AK59044965A0 (EMS reports)
Dell Keyboard	---
Dell Mouse	---
DS200 1.2	SN 0110340435
Verizon 4G Modem MTSMC-LVW3	20150243
DS200 Carrying case	HW 1.4
DS200 Steel ballot box w/ diverter	No SN found
DS200 1.3	SN 0315412960
Verizon 4G Modem MTSMC-LVW3	5347991K
DS200 Carrying case	HW 1.4
DS200 Plastic Ballot Box	HW 1.4
DS450	SN DS4516053019
OKI B432	AK34002391A0
OKI Microline 420 log printer	AE72011457C0
APC SMART-UPS	3B1B03B421012E
DS850	SN DS8510090039
OKI B431dn	AK53043027A0
OKI Microline 420 log printer	AK5C018657E0
APC BACK-UPS	4B1636P32814
ExpressVote 1.0	SN EV0115370807
ExpressVote rolling kiosk includes integrated QR code scanner	K0116362729
ExpressVote 2.1	SN EV0218382364
ExpressVote voting booth workstation	EV-booth-01
External QR code scanner	SN 15272010505004
AutoMARK	106432020

2.1 Testing Configuration

The testing event utilized each of the above described setups of the EVS 5.3.4.1 and its components. The following is a breakdown of the EVS 5.3.4.1 components and configurations for the test setup:

Standard Testing Platform:

The standard testing platform consisted of a precinct setup with the following components:

- Two DS200 Precinct Ballot Tabulators

- One AutoMARK Voter Assist Terminal

- One ExpressVote Universal Voting System, Hardware 1.0 in Rolling Kiosk

- One ExpressVote Universal Voting System, Hardware 2.1 in Voting Booth Workstation The

standard testing platform also consisted of a central office setup with the following components:

- DS850 Central Ballot Tabulator

- DS450 Central Ballot Tabulator

- EMS Components

Elections and ballots/cards were supplied by ES&S. Once ballots/cards were marked and subsequently cast on a DS200, the polls were closed and tabulation reports were printed, with results being further transported back to the EMS either manually or by telecommunication via modem. Ballots/cards were additionally cast on the DS850 and DS450 and manually transported or networked to the EMS. Results were tabulated on the EMS and reviewed and compared and found consistent with the expected results.

2.2 Test Support Equipment/Materials

All test support equipment/materials required to facilitate testing were supplied by ES&S.

3.0 TEST PROCESS AND RESULTS

The following sections outline the test process that was followed to evaluate the EVS 5.3.4.1 to the test goals defined in the scope of this Test Report.

3.1 General Information

All functional and system level testing was conducted by qualified Pro V&V personnel at the ES&S facility located in Omaha, NE.

3.2 Test Cases/Procedures

Test procedures were developed to evaluate the system being tested against the stated requirements. Prior to execution of the required test procedures, the system under test was subjected to testing initialization to establish the baseline for testing and ensure that the test candidate matched the expected test candidate and that all equipment and supplies are present.

The following tasks were completed during the testing initialization:

- Ensure proper system of equipment. Check network connections, power cords, keys, etc.

- Check version numbers of (system) software and firmware on all components.

- Verify the presence of only the documented COTS.

- Ensure removable media is clean.

- Ensure batteries are fully charged.

- Inspect supplies and test decks.

- Record protective counter on all tabulators.

- Review physical security measures of all equipment.

- Record basic observations of the testing setup and review.

- Record serial numbers of equipment.

- Retain proof of version numbers.

3.3 Summary Findings

Summary findings for the System Level Testing (System Integration Testing, Accuracy, and FCA), PCA (including Security Review), and Source Code Review are detailed in the relevant sections of this report. In addition to these areas of testing, a limited TDP Review was performed, as described below.

3.3.1   Technical Documentation Package (TDP) Review

In order to determine compliance of the modified TDP documents with the EAC VVSG 1.0, a limited TDP review was conducted. This review focused on TDP documents that have been modified since the certification of the baseline system. The review consisted of a compliance review to verify that each regulatory, state, or manufacturer-stated requirement had been met based on the context of each requirement.

A listing of all documents contained in the EVS 5.3.4.1 TDP is provided in Table 3-1.

Table 3-1: EVS 5.3.4.1 Technical Data Package

Document Name	Doc. Revision
01 TDP - 00_Preface	
Requirements of the 2005 VVSG Trace to Technical Data Package - ES&S Voting System 5.3.4.1	1.0
01_System Overview	
System Overview - ES&S Voting System 5.3.4.1	1.1

02_System Functionality Description	
System Functionality Description - ES&S Voting System 5.3.4.1	1.0
03_System Hardware Specifications	
AutoMARK System Hardware Overview	9.0
AutoMARK System Hardware Specification	6.0
DS200 1.2 Hardware Specification	3.5
DS200 1.3 Hardware Specification	4.7
DS450 1.0 Hardware Specification	1.6
DS850 1.0 Hardware Specification	1.6
ExpressVote Hardware Specification 1.0	3.10
ExpressVote Hardware Specification 2.1	1.3
03_System Hardware Specifications - Approved Parts List	
AutoMARK A100 Approved Parts List	2.0
AutoMARK A200 Approved Parts List	2.0
AutoMARK A300 Approved Parts List	2.0
Approved Parts List: DS200 HW Rev 1.2	1.1
Approved Parts List: DS200 HW Rev 1.3	1.6
Approved Parts List: DS450 HW Rev 1.0	1.1
Approved Parts List: DS850 HW Rev 1.0	1.1
Approved Parts List: ExpressVote HW Rev 1.0	1.1
Approved Parts List: ExpressVote HW Rev 2.1	2.3
04_Software Design and Specifications	
Coding Standards	1.2
System Development Program	1.5
License Agreements for Procured Software	1.3

Table 3.1: EVS 5.3.4.1 Technical Data Package *(continued)*

Document Name	Doc. Revision
04_Software Design and Specifications (continued)	
DS200 - Software Design Specification	1.0
DS450 – Software Design Specification	1.0
DS850 - Software Design Specification	1.0
Electionware - Software and Design Specification	1.1
ES&S Software Design Specifications Event Log Service (ELS)	1.0

Document Name	Doc. Revision
ES&S Software Design Specifications Election Reporting Manager (ERM)	1.0
ExpressVote Software Design and Specification	1.0
ExpressVote (Hardware Version 2.1) Software Design Specification	1.0
04_Software Design and Specifications – AutoMARK SDS	
AutoMARK ESS Ballot Image Processing Specification AQS-18-5002-003-S	6.0
AutoMARK ESS Ballot Scanning and Printing Specification AQS-18-5002-007-S	5.0
AutoMARK ESS Driver API Specification AQS-18-5000-002-F	5.0
AutoMARK ESS Embedded Database Interface Specifications AQS-18-5002-005-S	6.0
AutoMARK ESS GUI Design Specifications AQS-18-5001-005-R	6.0
AutoMARK ESS Operating Software Design Specifications AQS-18-5001-002-R	5.0
AutoMARK ESS Operations and Diagnostic Log Specs AQS-18-5002-004-S	5.0
AutoMARK ESS Programming Specifications Details AQS-18-5001-011-R	6.0
AutoMARK ESS Software Design Spec AQS-18-5001-004-S	7.0
AutoMARK Voter Assist Terminal (VAT) ESS Software Design Spec Overview	N/A
AutoMARK ESS Software Development Environment AQS-18-5001-006-R	5.0
AutoMARK ESS Software Diagnostics Specifications AQS-18-5000-004-F	5.0
AutoMARK ESS Software Standards Specification AQS-18-4000-000-S	5.0
05_System Test and Verification - 01_UsabilityTestReports	
ES&S AutoMARK Voter Assist Terminal (VAT)	1.X
DS200 Precinct Ballot Scanner	1.2.1
ExpressVote Usability Report ES&S Voting System 5.2.0.0	N/A
06_System Security Specification	
AutoMARK ESS System Security Specification AQS-18-5002-001-S	7.0
EMS Client Workstation Secure Setup & Configuration Guide	1.0

Table 3.1: EVS 5.3.4.1 Technical Data Package *(continued)*

Document Name	Doc. Revision
06_System Security Specification (continued)	
EMS Server Secure Setup & Configuration Guide	1.0
Best Practices for Physically Securing ES&S Equipment	1.0
Standalone EMS Workstation Secure Setup & Configuration Guide	1.0
Voting System Security Specification	1.0
Security Script Description	1.0
CradlePoint Setup & Configuration Guide	1.0

Document Name	Doc. Revision
Firewall Setup & Configuration Guide	1.0
Data Communication Server Secure Setup & Configuration Guide	1.0
06_System Security Specification - 01_VerificationProcedures&Scripts	
Verification Procedure, Election Management System Workstation and Server	1.0
Verification Procedure: AutoMARK Ballot Marking Device	1.0
Verification Procedure: DS850 High-Speed Scanner & Tabulator	1.0
Verification Procedure: DS450 High-Throughput Scanner & Tabulator	1.0
Verification Procedure: DS200 Precinct Scanner and Tabulator	1.0
Verification Procedure: ExpressVote Hardware 1.0	1.0
Verification Procedure: ExpressVote Hardware 2.1	1.0
06_System Security Specification - 02_ValidationFileLists	
EVS5341_D_L01_StaticDynamicFileList_Electionware.xlsm	1.1
EVS5341_D_L02_StaticDynamicFileList_ExpressVote_HW1'0	1.0
EVS5341_D_L02_StaticDynamicFileList_ExpressVote_HW2'1	1.2
EVS5341_D_L03_StaticDynamicFileList_DS450.xlsm	1.0
EVS5341_D_L04_StaticDynamicFileList_DS200.xlsm	1.2
EVS5341_D_L05_StaticDynamicFileList_DS850.xlsm	1.0
EVS5341_D_L06_StaticDynamicFileList_AutoMARK.xlsm	1.0
EVS5341_D_L08_StaticDynamicFileList_ERM.xlsm	1.0
EVS5341_D_L11_StaticDynamicFileList_ExpressVotePreviewer_HW1'0	1.0
EVS5341_D_L11_StaticDynamicFileList_ExpressVotePreviewer_HW2'1	1.1
EVS5341_D_L19_StaticDynamicFileList_VATPreviewer.xlsm	1.0

Table 3.1: EVS 5.3.4.1 Technical Data Package *(continued)*

Document Name	Doc. Revision
06_System Security Specification - 10_BuildProcedures	
Build Procedure: DS200 Precinct Scanner & Tabulator Trusted Build 1	1.1
Build Procedure, Election Management System Trusted Build 1	1.1
06_System Security Specification - 10_BuildProcedures-Harvested	
Build Environment Construction: VM Ds450 Central Scanner & Tabulator	1.0
Build Procedure, DS450 Trusted Build 1	1.0
Build Procedure: DS850 Central Scanner & Tabulator Trusted Build 1	1.0

Commercial-Off-The-Shelf Install Guide DS200 Ancillary Devices ES&S Voting System 5.0.0.0	1.1
Build Environment Construction, Election Management System	1.4
Build Procedure: ExpressVoteUVS-v1 and ExpressVoteUVS-v1 Previewer Trusted Build 1	2.0
Build Environment Construction VM, EMS	1.2
Build Environment Construction, ExpressVote	1.1
Build Procedure, AutoMARK VAT and VAT Previewer Trusted Build 1	1.1
Build Procedure: cipherUpdateKeys Trusted Build 1	1.2
Build Environment Construction, AutoMARK VAT and VAT Preview	1.1
Build Procedure: ExpressVoteUVS-v1 and ExpressVoteUVS-v1 Previewer Trusted Build 1	1.0
Build Procedure: ExpressVoteUVS-v2 and ExpressVoteUVS-v2 Previewer Trusted Build 1	1.0
Build Procedure, Election Management System Trusted Build 1	1.0
Build Environment Construction Election Management System	1.0
Title: Build Environment Construction, EMS, Addendum 1	1.0
Build Environment, Installer, Windows Embedded Standard 7	1.2
Build Process Microsoft Windows Embedded Developer Update	1.1
Build Procedure, Election Management System Trusted Build 2	1.0
Build Procedure, ExpressVote COTS Image Trusted Build 3	1.3
Build Procedure, Windows Embedded Standard 7 Installer	1.3
Build Environment Construction: ExpressVote UVS-V2	1.1
Build Environment Construction, Election Management System	1.3

Table 3.1: EVS 5.3.4.1 Technical Data Package *(continued)*

Document Name	Doc. Revision
07_System Operations Procedures	
AutoMARK Operator's Guide Firmware Version 1.8	1.0
DS200 Operator's Guide Firmware Version 2.12	1.1
DS200 Operator's Guide Appendices Firmware Version 2.12	1.0
DS450 Operator's Guide Firmware Version 3.0	1.2
DS450 Operator's Guide Appendices Firmware Version 3.0	1.0
DS850 Operator's Guide Firmware Version 2.10	1.2
DS850 Operator's Guide Appendices Firmware Version 2.10	1.0
EVS Event Logging Service User's Guide Software Version 1.5	1.0

Election Reporting Manager User's Guide Software Version 8.12	1.0
Election Reporting Manager User's Guide Appendices Software Version 8.12	1.0
Electionware Vol. I: Administrator Guide Software Version 4.7.5.0	1.1
Electionware Vol. II: Define User Guide Software Version 4.7.5.0	1.0
Electionware Vol. III: Design User Guide Software Version 4.7.5.0	1.0
Electionware Vol. IV: Deliver User Guide Software Version 4.7.5.0	1.2
Electionware Vol. V: Results User Guide Software Version 4.7.5.0	1.0
Electionware Vol. VI: Appendices Software Version 4.7.5.0	1.0
ExpressVote Operator's Guide Firmware Version 1.4	1.0
ExpressVote Operator's Guide Appendices Firmware Version 1.4	1.0
ExpressVote Operator's Guide Hardware Version 2.1 Firmware Version 2.4	1.0
08_System Maintenance Manuals	
AutoMARK Maintenance Manual Firmware Version 1.8	1.0
DS200 Maintenance Manual Firmware Version 2.12	1.0
DS450 Maintenance Manual Firmware Version 3.0	1.0
DS850 Maintenance Manual Firmware Version 2.10	1.0
ExpressVote Maintenance Manual Firmware Version 1.4	1.0
ExpressVote Maintenance Manual Firmware Version 2.4 Hardware Version 2.1	1.0
09_Personnel Deployment and Training	
Personnel Deployment and Training Program	1.1

Table 3.1: EVS 5.3.4.1 Technical Data Package *(continued)*

Document Name	Doc. Revision
10_Configuration Management Plan	
Configuration Management Program	2.1
Technical Documentation Program	1.3
11_QA Program	
Manufacturing Quality Assurance Program	1.9
Software Quality Assurance Program	1.2
12_System Change Notes	
ES&S Voting System 5.3.4.1 System Change Notes	1.0
13_Attachments	
Ballot Production Guide for EVS	3.2

Summary Findings:

A versioning review was conducted, as well as functionality and compliance reviews on the modifications made following the previous certification testing. This review did not address consistency or completeness of documents. Results of the review of each document were entered on the TDP Review Checklist. Any documents that were revised during the TDP review process were compared with the previous document revision to determine changes made, and the document was re-reviewed to determine whether the discrepancies had been resolved.

During execution of the test campaign, it was verified that the technical documentation provided for the EVS 5.3.4.1 was effectively reviewed with all discrepancies that were noted during the review being resolved.

3.3.2   Source Code Review

Pro V&V reviewed the submitted source code to the EAC VVSG 1.0 and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V verified that the submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met. The source code review was based on the source code changes made since the previous system was certified.

Summary Findings:

During execution of the test procedure, it was verified that the source code provided for the EVS 5.3.4.1 successfully met the requirements. After a review of the submitted code was completed, all issues were reported and resolved prior to the Trusted Build. To perform the trusted build, ES&S submitted source code, COTS, and third-party software products. These items were inspected and combined to create the executable code. Additionally, during the performance of the trusted build, the build documentation was

reviewed. During execution of the Trusted Build, the source code submitted by ES&S and reviewed by Pro V&V was successfully built using the submitted COTS and third-party software products, and the reviewed build documentation.

3.3.3   Physical Configuration Audit

The Physical Configuration Audit (PCA) compares the voting system components submitted for certification testing to the manufacturer's technical documentation. The purpose of the PCA was to verify that the submitted hardware is unmodified from the previously certified voting system. The PCA included the following activities:

- Establish a configuration baseline of software and hardware to be tested; confirm whether manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system

- Verify software conforms to the manufacturer's specifications; inspect all records of manufacturer's release control system; if changes have been made to the baseline version, verify manufacturer's engineering and test data are for the software version submitted for certification

- If the hardware is non-COTS, Pro V&V reviewed drawings, specifications, technical data, and test data associated with system hardware to establish a system hardware baseline associated with the software baseline

- Review manufacturer's documents of user acceptance test procedures and data against system's functional specifications; resolve any discrepancy or inadequacy in manufacturer's plan or data prior to beginning system integration functional and performance tests

- Subsequent changes to baseline software configuration made during testing, as well as system hardware changes that may produce a change in software operation are subject to re-examination

Summary Findings:

During execution of the test procedure, the components of the EVS 5.3.4.1 were documented by component name, model, serial number, major component, and any other relevant information needed to identify the component. For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. Additionally, each technical document submitted in the TDP was recorded by document name, description, document number, revision number, and date of release. At the conclusion of the test campaign, test personnel verified that any changes made to the software, hardware, or documentation during the test process were fully and properly documented.

3.3.4 System Level Testing

System Level Testing included the Functional Configuration Audit (FCA), the Accuracy Test, and the System Integration Tests. The Accuracy Test and the System Integration Tests were performed as part of the Regression Test requirements for this campaign. System Level Testing was implemented to evaluate the complete system. This testing included all proprietary components and COTS components (software, hardware, and peripherals).

The FCA for this test campaign focused on telecommunications capabilities (modeming) and write-in support.

This evaluation utilized baseline test cases as well as specifically designed test cases and included predefined election definitions for the input data. As part of the FCA, two Primary Elections and one General Election were executed to verify that each of the submitted modifications had been successfully implemented. The System Integration Tests were performed to verify the EVS 5.3.4.1 functioned as a complete system.

During System Level Testing, the system was configured exactly as it would for normal field use per the procedures detailed in the submitted technical documentation. This included connecting all supporting equipment and peripherals as well as any physical security equipment such as locks and ties.

3.3.4.1 Functional Configuration Audit (FCA) / Regression Testing

During testing, modified functionality was observed to note any changes to documented baseline functionality. This testing used both positive and negative criteria to measure conclusions. The primary focus of the FCA was the incorporation of the modifications to the system.

Regression testing was additionally performed as needed on the system components to verify that all functional and/or software modifications made during the test campaign did not adversely affect the system and its operation.

Summary Findings:

During testing all modification performed as documented and nothing was noted suggesting that additional testing was needed.

3.3.4.2 Accuracy

The Accuracy test addressed the capability to successfully transmit accurate results. After test performance, results were verified on each component and transmitted to the EMS where they were compiled and re-verified to be accurate.

Summary Findings:

The EVS 5.3.4.1 accurately captured as well as recorded ballot selections and integrated the results using the EMS. All results obtained during test execution matched the expected results.

3.3.4.3 System Integration

The system level certification tests addressed the integration of the hardware and software. This testing focused on the compatibility of the voting system software components and subsystems with one another and with other components of the voting system as a whole. During test performance, the system was configured as would be for normal field use.

Summary Findings:

One General Election and two Primary Elections were successfully exercised on the voting system, with the breakdowns as described below:

— General Election GEN-01: A basic election held in four precincts, one of which is a split precinct. This election contains 19 contests compiled into four ballot styles. Five of the contests are in all four ballot styles. The other 15 contests are split between at least two of the precincts with a maximum of four different contest spread across the four precincts.

— Primary Election PRIM-01: Open Primary Election in two precincts. This election contained 30 contests compiled into five ballot styles. Each ballot style contains six contests.

— Primary Election PRIM-02: Closed Primary Election held in ten precincts: Rhode Island Presidential Preference Primary election (RI PPP). This election contains seven contests compiled into ten ballot styles. A total of three contests linked to Democratic candidates and four contests linked to Republican candidates. Of the three contests on Democratic ballots, two rotate in and out depending on even and odd precincts. Of the four contests on Republican ballots, two rotate in and out depending on even and odd precincts.

The EVS 5.3.4.1 successfully completed the system level integration tests with all results obtained during test execution matching the expected results.

4.0 CONCLUSION

The EVS 5.3.4.1, as presented for testing, successfully met the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0, with no deficiencies or anomalies noted during testing. Additionally, Pro V&V, Inc. has determined that the EVS 5.3.4.1 functioned as a complete system during System Integration Testing.

Appendix A

Table A1.1: Ancillary Components

System Component	Software or Firmware Version	Hardware Version(s)	Description
Electionware – ToolBox Test Deck*	3.5.0.0	---	Optional means for the election official to test the election on each machine
Electionware – ToolBox Text to Speech	3.5.0.0	---	An optional simplified method for creating the audio wave files

Component not tested as part of this test campaign

Appendix E: **Voting System Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices**

PART I: PROPOSED TESTING STANDARDS

Applicable VVSG Standard

The modem component of the voting system or equipment must be tested to the requirements contained in the most recent version or versions of the Voluntary Voting System Guidelines (VVSG) currently accepted for testing and certification by the U.S. Election Assistance Commission (EAC). Compliance with the applicable VVSG may be substantiated through federal certification by the EAC, through certification by another state that requires compliance with the applicable VVSG, or through testing conducted by a federally certified voting system test laboratory (VSTL) to the standards contained in the applicable VVSG. Meeting the requirements contained in the VVSG may substantiate compliance with the voting system requirements contained in Section 301 of the Help America Vote Act of 2002 (HAVA).

Access to Election Data

Provisions shall be made for authorized access to election results after closing of the polls and prior to the publication of the official canvass of the vote. Therefore, all systems must be capable of generating an export file to communicate results from the election jurisdiction to the Central processing location on election night after all results have been accumulated. The system may be designed so that results may be transferred to an alternate database or device. Access to the alternate file shall in no way affect the control, processing, and integrity of the primary file or allow the primary file to be affected in any way.

Security

All voting system functions shall prevent unauthorized access to them and preclude the execution of authorized functions in an improper sequence. System functions shall be executable only in the intended manner and order of events and under the intended conditions. Preconditions to a system function shall be logically related to the function so as to preclude its execution if the preconditions have not been met.

Accuracy

A voting system must be capable of accurately recording and reporting votes cast. Accuracy provisions shall be evidenced by the inclusion of control logic and data processing methods, which incorporate parity, and checksums, or other equivalent error detection and correction methods.

Data Integrity

A voting system shall contain provisions for maintaining the integrity of voting and audit data during an election and for a period of at least 22 months thereafter. These provisions shall include protection against:
- the interruption of electrical power, generated or induced electromagnetic radiation.

- ambient temperature and humidity.

- the failure of any data input or storage device.

- any attempt at an improper data entry or retrieval procedure.

Reliability

Successful Completion of the Logic and Accuracy test shall be determined by two criteria
- The number of failures in transmission
- and the accuracy of vote counting
The failure or connectivity rate will be determined by observing the number of relevant failures that occur during equipment operation. The accuracy is to be measured by verifying the completeness of the totals received.

PART II: TEST PROCEDURES AND PROTOCOLS

Overview of Telecommunication Test

The telecommunication test focuses on system hardware and software function and performance for the transmission of data that is used to operate the system and report election results. This test applies to the requirements for Volume I, Section 6 of the EAC 2005 VVSG. This testing is intended to complement the network security requirements found in Volume I, Section 7 of the EAC 2005 VVSG, which include requirements for voter and administrator access, availability of network service, data confidentiality, and data integrity. Most importantly, security services must restrict access to local election system components from public resources, and these services must also restrict access to voting system data while it is in transit through public networks. Compliance with Section 7, EAC 2005 VVSG shall be evidenced by a VSTL report submitted with the vendor's application for approval of a voting system.

In an effort to achieve these standards and to verify the proper functionality of the units under test, the following methods will be used to test each component of the voting system:

Wired Modem Capability Test Plan

Test Objective: To transfer the results from the tabulator to the Election Management System via a wired network correctly.

Test Plan:

1. Attempt to transmit results prior to the closing of the polls and printing of results tape

2. Set up a telephone line simulator that contains as many as eight phone lines

3. Perform communication suite for election night reporting using a bank with as many as seven analog modems:
a. Connect the central site election management system to the telephone line simulator and connect the modems to the remaining telephone line ports
b. Setup the phone line numbers in the telephone line simulator
c. Use the simulated election to upload the election results
 i. Use at least eight tabulators in different reporting units
ii. Use as many as two tabulators within the same reporting units

   d. Simulate the following transmission anomalies
   i. Attempt to upload results from a tabulating device to a computer which is not part of the voting system
  ii. Attempt to upload results from a non-tabulating device to the central site connected to the modem bank
 iii. Attempt to load stress by simulating a denial of service (DOS) attack or attempt to upload more than one polling location results (e.g., ten or more polling locations)

Wireless Capability Test Plan

Test Objective: To transfer the results from the tabulator to EMS via a wireless network correctly.

Test Plan:

1. Attempt to transmit results prior to the closing of the polls and printing of results tape.

2. Perform wireless communication suite for election night reporting:
  a. Use the simulated election to upload the election results using wireless transfer to the secure FTP server (SFTP)
  b. Use at least eight tabulators in different reporting units
  c. Use as many as two tabulators within the same reporting unit

3. Simulate the following transmission anomalies
  a. Attempt to upload results from a tabulating device to a computer which is not part of the voting system
  b. Attempt to upload results from a non-tabulating device to the SFTP server
  c. Attempt to load stress by simulating a denial of service (DOS) attack or attempt to upload more than one polling location results (e.g., ten or more polling locations)
  d. If possible, simulate a weak signal
  e. If possible, simulate an intrusion

Test Conclusions for Wired and Wireless Transmission

- System must be capable of transferring 100% of the contents of results test packs without error for each successful transmission.

- Furthermore, system must demonstrate secure rate of transmission consistent with security requirements.

- System must demonstrate the proper functionality to ensure ease of use for clerks on election night.

- System must be configured such that the modem component remains inoperable until after the official closing of the polls and printing of one (1) copy of the results tape**.**

PART III: PROPOSED SECURITY PROCEDURES

Staff recommends that as a condition of purchase, any municipality or county which purchases this equipment and uses modem functionality must also agree to the following conditions of approval.

1. Devices which may be incorporated in or attached to components of the system for the purpose of transmitting tabulation data to another data processing system, printing system, or display device shall not be used for the preparation or printing of an official canvass of the vote unless they conform to a data interchange and interface structure and protocol which incorporates some form of error checking.

2. Any jurisdiction using a modeming solution to transfer results from the polling place to the central count location may not activate the modem functionality until after the polling place closes.

3. Any municipality using modeming technology must have one set of results printed before it attempts to modem any data.

4. Any municipality purchasing and using modem technology to transfer results from the polling location to the central count location must conduct an audit of the voting equipment after the conclusion of the canvass process.

5. Default passwords provided by ES&S to county/municipality must be changed upon receipt of equipment.

6. Counties must change their passwords after every election.

PART IV: CONDITIONS FOR APPROVAL (VENDOR)

Additionally, staff recommends that, as a condition/continuing condition of approval, ES&S shall:

1. Reimburse actual costs incurred by the WEC. and local election officials, where applicable, in examining the system *(including travel and lodging)* pursuant to state processes.

2. Configure modem component to remain inoperative (incapable of either receiving or sending transmissions) prior to the closing of the polls and the printing of tabulated results.

Appendix F: ExpressLink Testing Protocol

WEC Protocol for Approving the Elections Systems and Software ExpressLink Component

Background

As part of an application submitted on March 17, 2017, Elections Systems and Software (ES&S) requested the Wisconsin Elections Commission (WEC) to certify the ExpressLink component as part of the EVS 5.2.2.0 and EVS 5.3.2.0 systems. ExpressLink was outside of the scope of certification that was granted by the Elections Assistance Commission (EAC) for those systems. The WEC staff review of the application materials for EVS 5.2.2.0 and EVS 5.3.2.0 determined that this component was part of the voting system and should be subject to testing and certification, contrary to the EAC review. This component was not included in the voting equipment system that was certified for use in Wisconsin by the WEC on June 20, 2017. Staff was instructed, however, to create a protocol to test and certify the ExpressLink component outside of the EAC process. Wis. Stat. § 5.91 provides that the WEC may certify any such voting device, automatic tabulating equipment, or related equipment or materials regardless of whether any such system is approved by the EAC and this protocol outlines the procedures for reviewing the ExpressLink consistent with this statutory authority.

Component Information
The ExpressLink is designed for use by election officials in conjunction with the ExpressVote Universal Voting System that was approved as part of the EVS 5.2.20 and EVS 5.3.2.0 systems. This voting system component consists of both the ExpressLink software application and one piece of hardware, the ExpressVote Activation Card Printer. ExpressLink is a Windows application housed on a laptop computer that uses contest and candidate information imported from Election Ware election management system to determine the appropriate ballot style for a voter. The system then prints the activation barcode using the ExpressVote Activation Card Printer. The ExpressVote Activation Card Printer is a small, thermal, on demand printer used to print the ballot activation barcode on the ExpressVote ballot card. A voter would then use the ballot card that contains the barcode printed via the ExpressLink to activate the correct ballot style on the ExpressVote Universal Voting System.

Review and Testing Process

- WEC staff shall complete a review of supporting documentation provided by the vendor that details the functionality of the ExpressLink before functional testing is conducted. The manufacturer shall provide both a full and a redacted set of the following documentation as part of the process to review the component, if applicable:

o Complete specifications for all hardware, firmware and software;

o All technical manuals and documentation related to the component;

o Complete instruction materials necessary for the operation of the equipment and a description of training available to users and purchasers;

o Reports from voting system test laboratories accredited by the US Election Assistance Commission (EAC) demonstrating that the system component functions as described by the vendor in the application materials.

o A list of all the states and municipalities in which the system has been approved for use and how long the ExpressLink component has been in use in those jurisdictions.

o If any portion of the materials provided to the Wisconsin Elections Commission is copyrighted, trademarked, or otherwise trade secret, the application shall include written assertion of any protected interests and redacted versions of the application and all materials consistent with any properly asserted protected interests. Simply identifying the individual item as "proprietary" is not sufficient. Any assertion of proprietary rights must include detailed specifics of each item protected, the factual and legal basis for protection, whether there is anything public within the protected item, and if there is, how to extract it along with a statement whether there are costs to do so.

o If applicable, provide the WEC with a list of software components, pursuant to Wis. Stat. § 5.905, that "record and tally the votes cast with this system." For purposes of this condition, "software components" include vote-counting source code, table structures, modules, program narratives and other human-readable computer instructions used to count votes with this system.

• The vendor shall submit the component to the WEC for functional testing. The hardware and software submitted for certification testing shall be equivalent, in form and function, to the actual production versions of the component.

o An operational status check shall be conducted on the ExpressLink to determine if it functions as described by the vendor using the following procedures:

  ▪ Arrange the system for normal operation and power on the system.
  ▪ Perform any servicing, and make any adjustments necessary, to achieve operational status.
  ▪ Operate the equipment in all modes, demonstrating all functions and features that would be used during election operations.
  ▪ Commission staff shall verify that all system functions have been correctly executed.

o Compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment, shall be determined through functional tests integrating the voting system software with the remainder of the system and to determine if the software meets the vendor's design specifications.

  ▪ The election definition file that is created in ElectionWare for use with the ExpressLink shall be verified to determine if the data contained in that file is accurate.
  ▪ The ExpressLink will be tested in a mock election to determine if it can print barcodes on ExpressVote ballot cards that access the correct ballot styles.
  ▪ The ExpressLink will be tested to determine if it can accommodate multiple ballot styles for an election on a single ExpressVote machine.
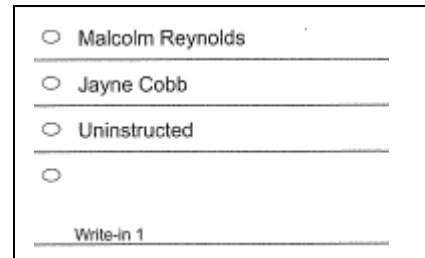
<u>Conditions for Approval (vendor)</u>

Additionally, staff recommends that, as a condition/continuing condition of approval, ES&S shall:

1. Reimburse the WEC for all costs associated with the testing campaign for the ExpressLink, where applicable, pursuant to state processes.

2. Agree to any additional conditions for approval and use that may be identified after the review and testing process is complete.

Appendix G: DS200 Write-In Report Testing and Pilot Test Protocol

In response to clerk interest as well as pending legislation, Commission staff conducted testing on the write-in report functionality of the DS200. Staff created a pilot testing protocol to account for and review how the DS200 would capture images of write-in votes in several scenarios and how the machine would display the write-in votes on the report that would be used to tabulate those votes. These scenarios included circumstances such as write-in votes with a blank oval or a write-in vote as part of an overvote or crossover vote. A total of 80 ballots were marked based on a customized test deck utilizing the election definitions from the General and Presidential Preference test elections. When the write-in report is enabled on the DS200, the write-in area on the ballot is roughly twice the size of what it would normally be, as illustrated by the example to the right.

The larger write-in area is required to ensure that write-in votes where the corresponding oval is not filled in by the voter will be captured on the write-in report. This programming must be done to allow for write-in votes to be tabulated in accordance with Wis. Stat. §7.50(d), which states that "If an elector writes a person's name in the proper space for write-in candidates for an office, it is a vote for the person written in for the office indicated, regardless of whether the elector strikes the names appearing in the same column for the same office, or places a mark by the same or any other name for the same office, or omits placing a mark to the right of the name written in". Under the proposed legislation, ballots cast via electronic voting equipment during the in-person absentee voting period would not be reviewed for write-in votes and all tabulation of write-in votes would be done using the output on the write-in report created by the voting equipment.

When programming a ballot with the larger write-in area, it is not possible to have multiple candidate lines represented. Write-in vote areas with two candidate lines are used in both Presidential and Gubernatorial elections in Wisconsin. The programming for the DS200 was unable to accommodate this style of write-in field. Testing showed that the write-in report functionality records images of write-in votes and tabulates the corresponding votes correctly and accurately.

As with traditional paper ballots, ballots from an ExpressVote with write-in votes will be imprinted with a pink circle by the tabulator prior to being dispatched to the ballot bin. To correctly account for write-in votes on ExpressVote ballots, they must be identified by election inspectors through a hand tally of ballots.

It is important to note that the write-in report testing was conducted on a pilot basis. Prior to further write-in report testing, staff would need to review the legislation if signed into law and gain Commission approval for an appropriate test protocol. If the Commission wishes staff to further explore DS200 write-in report testing or implementation, staff will work with Commissioners and management to address next steps.

Write-in Report Testing Checklist

Requirement	Pass: Y or N	Notes
Early voting demonstration from vendor (open polls multiple times, end of night procedures without closing polls, etc.)	Y	DS200 is simply shut down at the end of day with auto generated report cancelled by clerk; or lid can be closed and locked w/o powering down, putting it into a "sleep" mode.
Write-in report testing scenarios (outlined below): per the test deck	Y	If a ballot has write-ins that are part of a crossover or overvote situation, those votes do not appear on the report.
Write-in totals on tape and inclusion on write-in report: do they match the expected results?	Y	Since overvotes and crossover votes are not tallied nor captured on the write-in report, all contests tested reconciled.
Machine with multiple reporting units (simulate early voting scenario): Are the write-in records itemized by ward/precinct/reporting unit?	Y	EVS6040/6050 prints the write-in report by reporting unit, then by contest within that reporting unit.

1. Write-in Scenarios
   i Oval/good vote
   ii No oval/good vote
   iii Oval/blank vote
   iv Oval/w-i/overvote
   v No oval/w-i/overvote
   vi Oval/no w-i/overvote
   vii   Oval/crossover (PP, Pres Pref)
   viii   No oval/crossover (PP, Pres Pref)

APPENDIX H: **Wisconsin Voting Equipment Review Panel's Feedback**
These comments were provided via a structured feedback form.

1. How would you rate the functionality of the equipment?

Poor	Fair	Good	Excellent
		3	

- The new write-in tapes will be helpful.
- Straightforward.
- I did have one question about a ballot with miscellaneous marks. The device gave different messages.
- The upgrade to seeing the write-in votes by ward in the tape report seems helpful. We were not able to test the multi-language features that are available on the ExpressVote. It is odd that some municipalities are required to offer ballots in Spanish, but we are not able to test the multi-language function of the ExpressVote.

2. How would you rate the accessible features?

Poor	Fair	Good	Excellent
		3	

- I like the ExpressVote. I did not use the machine with the audio on, so I can't evaluate this from the perspective of a sight impaired voter.
- The AutoMark still was set up with yellow text on a white background when there is an undervote warning. In addition, while on that screen, the voter doesn't have the opportunity to change the contrast of the screen.

3. Rate your overall impression of the system.

Poor	Fair	Good	Excellent
		3	

- I would have liked if the DS200 had the same error message when same ballot was put through. I understand there is a setting that can fix that in the software.
- I like the collapsible ballot box.
- Still runs on Windows 7 as the operating system.